

PACIFIC RADIO NEWS

*Pioneer Journal of
Western Radio News and Development.*

-and here it is

You have asked for it. You have looked for it. You have hoped for it. And here it is—a transmitting tube for telephone and telegraph C-W transmission, built right up to British and to French Government specifications, including the SHAW standard four prong base.

The plate is nickel, a special molybdenum grid is provided, and the high vacuum permits operation on plate potentials of 500 volts without breakdown. Capacity is about 12.5 watts, and any number may be used in parallel—four make telephone conversation possible over 25 miles, telegraph signals over 50 miles.

Adopted by De Forest Radio Co. as the standard transmitting tube in all De Forest sets of less than $\frac{1}{2}$ k. w. capacity. Licensed under the De Forest Audion and Fleming patents. Other patents applied for and pending.

PRICE \$7.50
ORDER FROM
YOUR DEALER

WRITE FOR DESCRIPTIVE PAMPHLET

PACIFIC RADIO SUPPLIES CO.
638 Mission Street San Francisco, Cal.
ATLANTIC RADIO SUPPLIES CO.
8 Kirk Place Newark, N. J.

Distributors for Moorhead Laboratories, Inc.,
Manufacturers of

A-P Transmitting Tube

To be used only in apparatus manufactured by De Forest Radio

Tel. & Tel. Co.



E. J. Cunningham

announces

THE IDEAL AMATEUR TUBE
in this new
AudioTron Detector Type C-300
WITH STANDARD FOUR PRONG BASE



**Insist on Type
C-300
\$5.00**

Cunningham tubes are covered by patents dated 11-7-05, 1-15-07, 2-18-08, and others issued and pending. Licensed only for amateur or experimental uses in radio communication. Any other use will be an infringement.

TYPE C-300 possesses combination properties—it functions as a highly sensitive spark detector, an Audio-Frequency Amplifier, an Oscillator for regenerative amplification and C W reception, a radio-phone detector and amplifier—with the added advantages of low B Battery (18-22½ volts) ease and permanency of adjustment, uniformity and quietness.

Type C-300 is produced by an entirely new process of manufacture. Gas action must be coupled with electron emission for high signal audibility and sensitiveness as a detector. In the past it has been impossible to control this necessary gas content during manufacture and also obtain uniformity. Put Type C-300 to the test as we have in comparison with all previous types of tubes. I am confident of your answer.

Produced in large quantities entirely by machinery in the largest vacuum tube factory in the world has made it possible to offer Type C-300 at the remarkable price of \$5.00. Every tube is carefully inspected and tested and is guaranteed free of all mechanical and electrical defects.

Cunningham Type C 301 High Vacuum Amplifier

is designed to meet the demand for the Navy Type amplifier and regenerative receiver. The internal structure and exhaust permit operation at plate voltages of 40 to 100. Amplification constant 7 to 9 with internal impedance of 20,000 to 12,000 ohms. Price **\$6.50**

SEE YOUR DEALER TODAY and get your copy of Bulletin C-300 describing these new tubes. If your dealer cannot supply you send us his name and address and we will mail you a copy without charge.

Service and Quality since 1915 Guaranteed by

E. J. Cunningham

TRADING AS

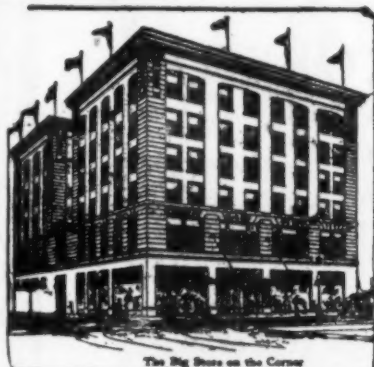
AUDIOTRON MFG. COMPANY

35 MONTGOMERY ST., DEPT. N

SAN FRANCISCO

Dealers - Jobbers

You will be interested in my proposition on the new tubes with the standard four prong base, packed in attractive individual cartons. DELIVERIES FOR 60 DAYS NECESSARILY IN ROTATION. Write today for full details.



The Big Store on the Corner

SEND FOR OUR CATALOG

Ask Your Dealer To Show You Our Goods

Young & McCombs

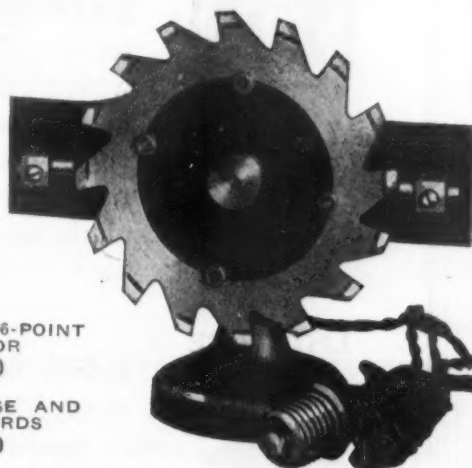
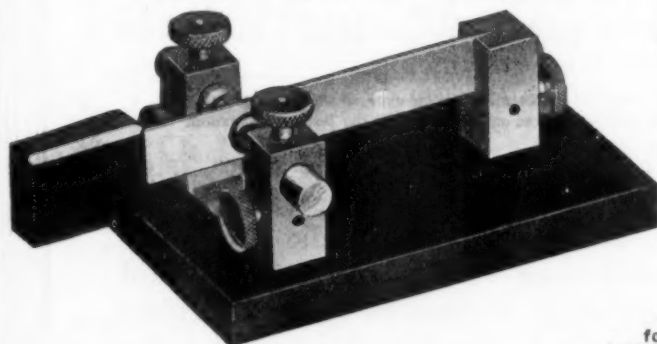
L. P. BEST PRES.
ROCK ISLAND, ILL.

MANUFACTURERS—JOBBER—RETAILERS

ROTARY GAP No. YM-1

A new development in the rotary line has been made expressly for Young & McCombs. Improvements on the well-known saw tooth rotary wheel make this gap the equal in tone and efficiency to any selling for twice the money. It is the only gap on the market which will run smoothly and reliably in either a horizontal or vertical position. Can be run in a vertical position while screwed to the wall. Rotor is machined cast aluminum with formica center. Has liberal sparking space and is drilled for either 1/4 or 3-16 shaft. Variable motor speed switch in base.

PRICE—Completely Assembled—\$16.00



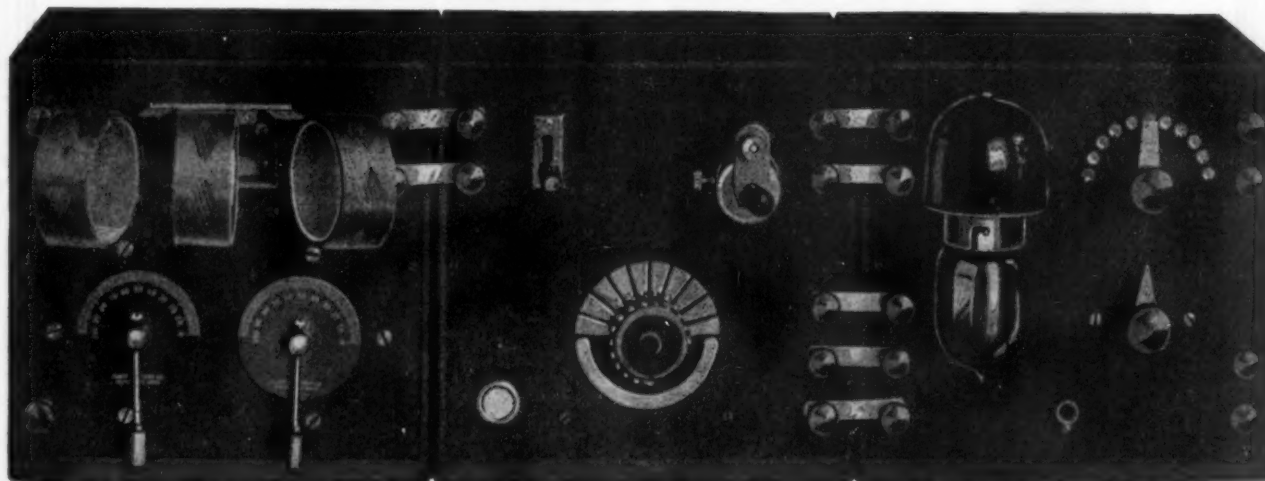
SAW-TOOTH 16-POINT
ROTOR
\$4.50

ROTOR BASE AND
STANDARDS
\$7.00

"COOTIE" KEY No. YM-6

The "Cootie" key is the snappiest sending device offered on the market for reliable spacing of characters. Large standards, formica knob, substantial silver contacts suitable for use up to 2 KW. The double action of the "Cootie" key lends an individuality to your sending. Price, Nickel-plated \$5.00.

UNIT SECTIONAL CABINET RECEIVERS



YM-7b

YM-9

YM-4e

A typical unit sectional cabinet receiver is here shown. We are the sole originators and designers of this type of receiver. Cabinets are of quarter sawed oak with "Early English" finish. Bakelite panels. Audion cabinet contains 60 volt variable "B" battery. This set, with proper honeycomb coils, is operative from 150 to 20,000 meters. Amplifiers may be added to these sets in any number. The crystal detector cabinet includes an enclosed buzzer and battery. All instruments can be supplied separately or in complete sets.

TUNERS

YM-7b—With plain mount.....\$29.50
YM-7a—With geared mount..... 32.50
(Less Coils)

CRYSTAL DETECTOR

YM-9 Complete with test buzzer
and battery\$24.50

DETECTORS-AMPLIFIERS

YM-4e Detector\$25.00
YM-5e Amplifier 31.00
(Less Bulbs)

WESTERN REPRESENTATIVE—LEO. J. MEYBERG CO., SAN FRANCISCO, CALIF.

RADIOTRONS VACUUM TUBES *for* Amateur or Experimental Use

THE facilities and resources of the world-famous RESEARCH LABORATORIES of the General Electric Company have been concentrated upon the development and design of a new series of VACUUM TUBES for Radio Detection and Amplification. The RADIO CORPORATION OF AMERICA now offers to the Wireless Experimenter two distinct types, each adapted to a particular field of usage.



LIST PRICE
\$5.00



LIST PRICE
\$6.50



Standard Grid Leak

A complete line of vacuum tube ACCESSORIES are now in manufacture and will shortly be available.

Dealers and Jobbers: We have an especially attractive proposition for you. Write us at once.

NOTE—A special "A" or filament battery potentiometer for close adjustment of the plate voltage of U. V. 200 will shortly be placed on the market by the Radio Corporation.

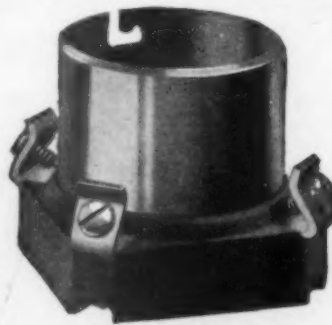
RADIOTRON U. V. 201, the second of the series, is an unexcelled Amplifier of the PLIOTRON type, which may be used for Detection and for Radio or Audio Frequency Amplification. Normal plate voltage, 40 (two standard "B" batteries). Voltages up to 100 may be used on the plate with increasing amplification. Amplification constant, 6.5 to 8 at 40 volts on the plate, 8 to 10 at 100 volts on the plate.

Note to Amateurs, Dealers and Jobbers

Radiotrons are manufactured by ultra-scientific methods laid down by America's foremost tube experts. No guess work—each tube bears the stamp of electrical manufacturers of world-wide reputation. A uniform product is assured. All tubes fitted with standard four-prong base. Filaments operate from 6 volt battery with rheostat.

LIST PRICES

Radiotron U. V. 200 . . .	\$5.00
Radiotron U. V. 201 . . .	6.50
Standard Vacuum Tube Socket . . .	1.00
Standard Grid Leak Mounted . . .	
100,000 ohms to 6 megohms . . .	1.25
Grid Leak Unit . . . . .	.75
Grid Leak Mounting . . . . .	.50
Audio Frequency Transformer . . .	7.50



Standard Vacuum Tube Socket

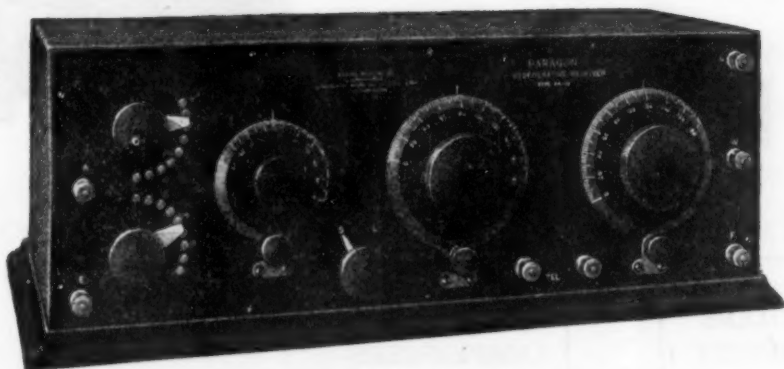
The Radio Corporation's tubes are covered by patents dated November 7th, 1905, January 15th, 1907, and February 18th, 1908, as well as by other patents issued and pending. Tubes licensed for amateur and experimental use only. Any other use will constitute an infringement.

Address all orders and enquiries to

SALES DIVISION

COMMERCIAL DEPARTMENT, Radio Corporation of America
233 Broadway, New York City

PARAGON RA-TEN



Licensed under Armstrong and Marconi Patent, 1,113,149.

Amplifying
Short Wave
Receiver

You'll Hear Stations You Never Heard Before

Just a Word About Our Mail Order Service

For out-of-town amateurs, we maintain the same standard of personal service in our Mail Order Department. Your order will be accurately filled and shipped within forty-eight hours. Twenty-five cents brings our 112 page catalog. We list a few different instruments below; see other current radio publications for a more complete listing.

AUDION CONTROL UNITS

Radio Craft Detector Unit	\$15.00
Radio Craft Detector and 1-Stage	50.00
Radio Craft Detector and 2-Stage	70.00
Radio Craft, 2-Stage	50.00
RORA Grebe Unit	12.50
RORH Grebe Unit (with batteries)	17.50
RORE Grebe 1-Stage Amp.	25.00
RORJ Grebe 2-Stage Amp.	50.00
RORG Grebe Det. and 1-Stage	47.00
RORD Grebe Det. and 2-Stage	75.00
P-400 De Forest Unit	12.00
P-401 De Forest Unit with cabinet	14.75
P-402 De Forest Unit with 40V battery	22.00
P-500 De Forest Audion, Ultra Audion	
with 40 volt battery	25.00
P-200 De Forest 2-Stage Amp. with 40-volt battery	70.50

RHEOSTATS

No. 2110 Porcelain Base	1.40
Paragon back mounted	1.75
G. R. back mounted	2.50

GRID LEAKS

Marconi complete with holder and leak	1.00
No. ROCA Grebe Condenser and leak	1.60
G-100 De Forest Variable leak .....	.75

ANTENNA SWITCHES

No. 463 Murdock	4.50
F-658 Clapp-Eastham	12.50

*Our Word of Honor Is Our Guarantee
Let Us Prove It*

—With This New Paragon!

THE PARAGON R. A. Ten covers amateur, commercial and navy wave-lengths. Advanced engineering design, combined with superior insulation and accurate controls, enables you to hear the weak station plainly and with proper selectivity, **THAT ONE STATION ONLY.** Here are a few outstanding features:

Wave length, 160 to 1000 meters
Amplification, 100 times
No dead end losses whatever
Vernier attachments on all controls.

The original R. A. 6 was the acknowledged superior of any other set on the market. This **NEW** triumph of Adams Morgan Co. is as far ahead of the R. A. 6 as that was ahead of all others.

All amplification is obtained without change of spark tone. Objectionable effect of change of note is entirely eliminated. Coupling has scale of 180 degrees.

The cabinet is of quartered oak; overall size 20 5-8 inches by 8 inches by 7 1-2 inches. Fitted with genuine Bakelite panel, knobs and dials. White filled engravings. Truly an instrument to be proud of.

Every set sealed and guaranteed for two years.

PRICE EIGHTY-FIVE DOLLARS

Send for our Special Bulletin on the Paragon R. A. Ten. Interesting and complete. Drop post card today.

Continental Radio and Electric Corp.

Sole Distributors of the Paragon RA-TEN

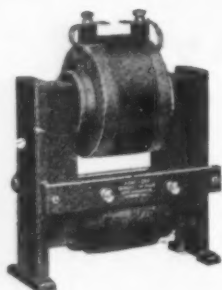
J. DI BLASI, Secretary

DEPT. G. 7.

6 WARREN STREET

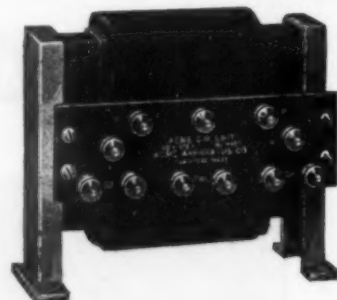
J. STANLEY, Treasurer

NEW YORK



Power factor 95 cent

Acme Apparatus

500 volts D. C.
350 volts D. C.

SPARK TRANSFORMERS
C. W. POWER TRANSFORMERS
MODULATION TRANSFORMERS
FILAMENT HEATING TRANSFORMERS

AMPLIFYING TRANSFORMERS
SPECIAL TRANSFORMERS
AMPLIFIERS
DETECTORS
CHOKE COILS

The ACME SPARK TRANSFORMERS have the highest efficiency, highest power factor, highest spark frequency and lowest price of any on the market.

The ACME C. W. POWER TRANSFORMERS are for use with rectifying tubes for supplying high voltage direct current and for lighting filaments.

The ACME MODULATION TRANSFORMERS are essential for large power tubes.

The ACME AMPLIFYING TRANSFORMERS are the result of experiments by transformer engineers. Correst ratio and impedance.

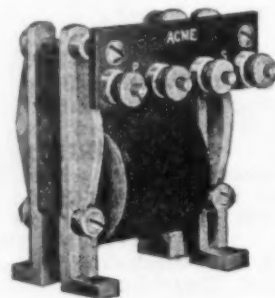
The ACME AMPLIFIER and ACME DETECTOR contain in a small space what so often required considerably more.

The ACME CHOKE COILS are 1 1-2 Henries for use in C. W. power circuits.

Small Enough For
A Xmas Stocking

PACIFIC COAST DEALERS

Arno A. Kluge, Los Angeles, Cal.
Western Radio Elec. Co., Los Angeles.
Leo. J. Meyberg, San Francisco, Cal.
Radio Shop, San Jose, Cal.
Wireless Shop, Los Angeles, Cal.
Meteor Elec. Co., Los Angeles, Cal.
Northwest Radio Service Co., Seattle, Wash.
Radio Development Co., San Francisco, Cal.
Radio Sales Co., San Francisco, Cal.
Southern Electrical Co., San Diego, Cal.

Small Enough For
A Xmas Stocking

Acme Apparatus Company 21 WINDSOR STREET,
CAMBRIDGE 39, MASS.

TRANSFORMER AND RADIO ENGINEERS AND MANUFACTURERS

When writing to Advertisers please mention this Magazine



Let these Tubes Enlighten Your Station on Christmas Eve

A SUGGESTION
What better gift could you give your radio friend than a vacuum tube and a subscription to "Pacific Radio News?"

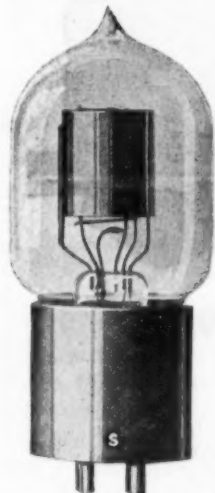
We are going to give them to you **FREE** of charge. Read this wonderful Christmas offer!

OFFER NUMBER 1—THE A. P. V. T. TUBE

Given free with a four year subscription to "Pacific Radio News." Specify whether an Oscillator, Amplifier or Detector tube is desired. Add 25c for mailing charges. These tubes sell for \$6.00 and \$7.00. They are genuine and guaranteed by the manufacturer.

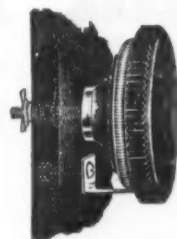
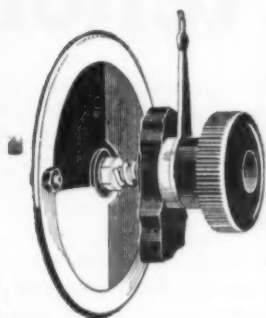
OFFER NUMBER 2—THE NEW CUNNINGHAM AUDIO-TRON TUBE

Given free with a four year subscription to "Pacific Radio News." The regular price of this tube is \$5.00. Add 25c for mailing charges. All tubes are genuine and guaranteed by the manufacturer.



OFFER NUMBER 4—THE NEW PARKIN .001 PANEL MOUNTING VARIABLE CONDENSER

Given free with a two year subscription to "Pacific Radio News." Add 10c for mailing charges.

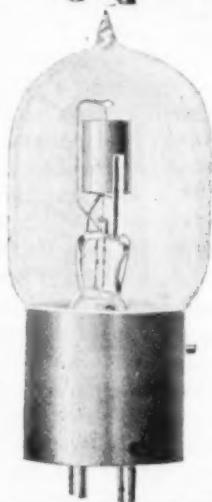


OFFER NUMBER 5—THE PARKIN PANEL RHEOSTAT FOR PANEL MOUNTING.

Given free with a one year subscription to "Pacific Radio News." Add 10c for mailing.

OFFER NUMBER 3—THE NEW A. P. TRANSMITTER TUBE. Will carry 12.5 watts.

Given free with a five year subscription to "Pacific Radio News." All tubes are guaranteed by the manufacturer. Regular price \$7.50. Add 25c for mailing charges.



OFFER NUMBER 6—THE PEN BRAND GRID CONDENSER

Constructed of Bakelite and Mica with



copper foil. Regular price \$1.00. Given free with a one year subscription to "Pacific Radio News." Add 10c for mailing charges.

Important! These premiums will be awarded on extensions, new subscriptions, or to those who desire to secure subscriptions from individuals.

PACIFIC RADIO PUB. CO.,
 50 Main St., San Francisco, Cal.

Herewith is \$..... andcents for mailing charges. Please send the apparatus described in offer number and "Pacific Radio News" foryears to:

Name

Address

Make it a Radio Christmas!

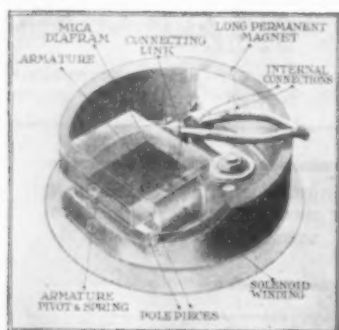


Now Dad-Hear the tenor

"I can listen in on all the radio concerts now, Dad. Those Baldwin phones you bought me for Christmas are corkers. Just listen to that famous tenor singing over the wireless telephone. Every note records just as clearly as though it were a phonographic reproduction right here in our own home."

Actually Baldy Phones reproduce in identically the same manner as do the high grade phonographs. Instead of a heavy iron diaphragm, as in most phones, a selected grade of mica is used. This is much more susceptible to distortion and as a result responds more readily to the thousands of overtones and harmonics of the human voice or any musical instrument.

Baldy's are the most sensitive phones in the world. This is attested to by the fact that the leading radio engineers, with every facility at their command for testing the audibility and sensitiveness of every make of phone, choose Baldwin for their personal use.



Study this X-Ray photo of a Baldwin ear-piece and you will see why they are world famed for their sensitiveness.

Our new booklet will give you some interesting facts about Baldwin Phones, in addition to prices. Ask your dealer for a copy. If he can not supply you write direct, giving his name and address.

JOHN FIRTH & CO., Inc.

18 Broadway

New York

Sole Distributors of

Eldridge Electrical Instruments

Kolster Decimeter

U. S. Bureau of Standard Wavemeter

Navy Standard Lyden Jars

Brownlie Adjustable Phones

BALDY FOR LAND SEA AND IN THE AIR PHONES

NOV 27 1920

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VOLUME II

DECEMBER, 1920

NUMBER 5

PAUL R. FENNER
Editor

H. W. DICKOW
Advertising Manager
50 Main St., S. F., Cal.

January issue forms
close on December 1.



PACIFIC RADIO NEWS

RADIOTORIAL

BY THE EDITOR

PUBLISHED MONTHLY

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the U. S.
\$2.50 in Foreign
Countries

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Pacific Radio Pub. Co.

TO ALL RADIO MEN, THOSE WHO WILL UNDERSTAND

CHRISTMAS is here. Merry Christmas. Peace, Good Will, Happiness and Contentment for all is abundant. One Christmas has passed since the great world war, but it has not been till this Christmas that all the boys have returned home, become settled and ready to appreciate all that Christmas means.

There is something about Christmas that brings cheer to the saddest heart, and if it does not, isn't there something wrong? Aren't there some of us, who, somehow or other, are never at rest without just decrying about this or that being wrong? What's the trouble? No resonance! **YOU**, who are not happy this Christmas, or rather, think you are not, just take a look at your hot wire meter, first, and see if the needle isn't waltzing with the **ZERO** mark. But don't waste time looking at the ammeter. Start in cleaning house. Don't just fix up the condenser with new connections, don't sandpaper your spark gap points, or just re-wire the old "junk heap." Build yourself a house on a stone foundation, as the parable says. Tear everything out, and build anew.

Resign your membership in the Inefficient Club; join the American Society of Efficientists. And remember this, men, there are no different grades of membership—all are the same—just plain **MEMBER**. A man in the One Inch Coil class rates as high as the man in the One Kilowatt Transformer class, just as does the Galena expert rank with the Vacuum Tube hound. So don't "bellyache" about not being able to join.

Now that you are a member, keep this in mind: your source of current supply is **UNLIMITED**. You can have all



you want. Just a word to the wise will be sufficient here; if you have a spark coil use six or eight volts of the unlimited direct current and if you use a transformer use the unlimited source of alternating current and use the right voltage. Next, but before hooking up your coil or transformer, fix everything

up nicely. Get each and every receiving instrument in tip top shape, discard the ones that are really more of a drag than a help and ask Dad, or Santa Claus, for some new ones if you really need new ones.

Be sure that everything is right, though. Don't work in the dark; remember there is **LIGHT**. For instance, don't use three No. 19 copper wires for a lead-in to an antenna having four No. 12 wires. That is wrong. **DO THINGS RIGHT; ALWAYS RIGHT**. If there is any point you are in question about remember that you can procure the information without trouble from good books, or write us; we'll tell you.

And when you are ready, tune up. Fix yourself so that you only radiate **PURE WAVES**. Also be sure of your **WAVE LENGTHS** and **SHARPNESS**. Of course, even a Radio Inspector would concede that it is not so necessary to be **SHARP** in every sense of the word, but you must not be over two hundred meters.

Now we assume that you are ready to send and receive. The next word of caution is this: **SEND WITH WISDOM**. Don't be selfish, don't take it all for yourself; think of others. Send at a speed which is such that each character is perfect, and perfectly spaced.

These words of wisdom have been written from the Unlimited Source of Supply, those who heed will have a very Merry Christmas, those who do not will not fare so well. You may have to read this over again, but you will understand with a little study. Merry Christmas to you, all of you, and think, too, that even static can be eliminated.

New York Office.....147 Sixth Ave.
Boston Office.....18 Boylston St.

Portland Office.....420 Bd. of Trade Bldg.
Chicago Office.....1306 Hartford Bldg.

Seattle Office.....419 Pioneer Bldg.
London Office.....62 and 8a, The Mall, Ealing

Entered as second class matter January 22, 1920, at the Post Office at San Francisco, Cal., under the Act of March 3, 1879.

THE RADIO CONVENTION--A STEPPING STONE TO PROGRESS



LEFT—Major J. F. Dillon, U. S. Radio Inspector of the 6th Radio District. Honorable Chairman of the Convention.

RIGHT—Willard E. Lufkin, Chairman of the Convention Committee, who has full charge of the affair.



Illustrations by J. L. SABO

THE Pacific Radio Convention at San Francisco, California, November 25th, 26th, 27th and 28th, will bring to the attention of the public the magnitude of the radio industry and provide one of the greatest mediums of intercourse between radio men ever held.

Never before has an attempt been made to bring radio men together with the purpose of exchanging ideas, demonstrating the fruit of their efforts, and for enjoying good fellowship in the profession, as in the coming Pacific Radio Convention. Each and every man who is affiliated with the radio industry and who does not come to San Francisco to profit by the convention will miss a rare opportunity of educating himself to future possibilities in the radio field. All

radio men should make it a point to be there, because there is a place waiting for every man in the "game" at San Francisco during the convention.*

THE FIRST CONVENTION MEETING

The first meeting will take place on Thursday morning, November 25th, Thanksgiving Day, at 10 a. m. This meeting will be the opening of the convention and only radio men will be in attendance. It is expected to open the convention with a speech by Mayor Rolph of San Francisco, given by radio telephone from his residence.

Major J. F. Dillon, Radio Inspector for the Sixth Radio District, is the Honorable Chairman of the convention. Nearly every Pacific Coast radio man and many others know Major Dillon as a fine character, a loyal and true friend, and a man unconcerned with petty prejudices which, in this day and time, are so common in radio circles. Major Dillon is one of the men who will make the convention a success.

The Chairman of the convention committees is Mr. Willard E. Lufkin, formerly a lieutenant in the Signal Corps of the United States Army. Mr. Lufkin is responsible for the financial success of the undertaking and has carried out his duties in a manner worthy of the highest commendation. He has been devoting his entire time to the management of the affair, and will be one of the principal figures of the convention. The responsible duties as chairman of the main committee were accepted by him after three former chairmen had declined to carry on the work.

The convention activities will be at 2460 Sutter street, near Divisadero street, in the auditorium of the S. F. Gymnastic Club. Take a No. 1, 2, 4, 24, or Municipal street car direct to the convention. Arrangements have been completed to seat 1000 radio men.

THE SECOND DAY OF THE CONVENTION

On Friday, November 26th at 8 p. m. the most phenomenal and magnificent radio show will open. Amongst the exhibitors will be the following:

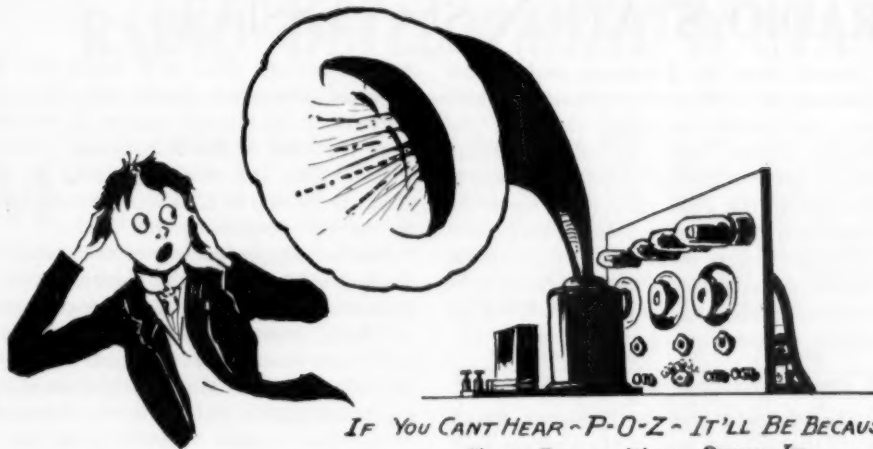
Pacific Radio Supplies Co.
De Forest R. Tel. and Tel. Co.
Leo J. Meyberg Co.
The Colin B. Kennedy Co.



They Will Be Coming From All Over.



People in the Vicinity Will Know There's Something Doing.



*IF YOU CAN'T HEAR - P-O-Z - IT'LL BE BECAUSE
YOUR EARS WON'T STAND IT*

Federal Telegraph Co.
Oard Radio Laboratories.
The Radio Telephone Shop.
Magnavox Co.
Nat. Radio Institute.
Ever Ready Battery Co.
Radio Corp'n. of America.
Army and Navy.
Pacific Radio News.
The Nostat Co.
Calif. Electric Supply Co.
San Francisco Radio Club.
Kilbourne & Clark Mfg. Co.

All radio engineers and operators know the important part taken by these organizations in radio work and development, and will therefore realize that the radio show for the convention will exceed all expectations.

The Federal Telegraph Company will install two complete Poulsen Arc Transmitters and Receivers. The Navy will install a complete radio compass station, to demonstrate to radio men and the general public, how a ship in a dense fog can always ascertain its exact position with this interesting development in radio sets. The Department of Commerce expects to have a booth

fitted up to give examinations for radio operators, first grade commercial, amateur, etc. Manufacturers of loud speaking devices, such as the Magnavox, and of radio telephones, will install apparatus which will surprise and educate many. Even the amateur will be represented. Many complete sets and pieces of apparatus, made by amateurs, will be displayed.

The auditorium, where the show will be held, and the building also, will be decorated with a novel scheme appropriate for the occasion.

The general public is cordially invited

to attend the show, and radio men are requested to bring as many friends as they can, to show them the wonders of wireless.

THE RADIO BANQUET

The Radio Banquet will be given on Friday, November 26th, at 7 p. m. in the banquet hall of the S. F. Gymnastic Club. The proverbial everything "from soup to nuts" will be served, and not only that, but some novel and interesting "stunts" will be shown also. It is expected that over 200 men (radio only) will attend. A good time for all is predicted and radio jokes and speeches will help to digest the dinner.

THE RADIO BALL

The Radio Ball will be a gala event. It will be held in the ball room of the Century Club of San Francisco. The affair will be invitational. The guests will be given an unusual treat in the form of a radio musical surprise. All menfolk will be those who are actively interested in radio. One hundred and twenty-five couples will be invited to attend.

In the January, 1921, issue of Pacific Radio News there will be a full account of the proceedings of the Pacific Coast Radio Convention.



THERE'LL BE NO QUESTIONS ABOUT THE INPUT EITHER



THERE WILL BE SOME ATTRACTION - I'LL SAY!

The show will be open till 11 p. m. Friday, November 26th, Saturday, November 27th, 1 p. m. till 11 p. m., and Sunday, November 28th, 1 p. m. to 11 p. m.

*If you are unable to attend, under any circumstances, the convention will be brought to you by PACIFIC RADIO NEWS. Send for a free copy of the January number.

BORDEAUX RADIO STATION SUCCESSFUL

The mammoth radio station at Bordeaux, France, for which the parts were manufactured in the plant of the Federal Telegraph Company at Palo Alto, and which were installed and tested by representatives of the local concern, has passed all tests satisfactorily and is now being operated by the French government, according to information received by Haradan Pratt, acting chief engineer of the Palo Alto plant, from Chief Engineer R. R. Beal and J. A. Miller, both of the Federal Company, who are still in France observing the operation of the station.

Considering the fact that the Bordeaux station is the largest ever built, it is interesting to the engineering world to know that in the entire thirty-day period of tests the station operated with perfect success without a single break or interruption, and it was never necessary at any time to make any changes or modifications of magnitude, so that the engineers from the Palo Alto factory were able to leave the station in the hands of the French operators after the tests were completed.

During the testing period, the French operators and engineers were trained to operate the station, and have been able to do so without any further assistance from the installing crew.

Signals from the Bordeaux station were observed by other radio stations scattered over the world, including those of the United States navy in the Hawaiian Islands and the Philippine Islands. Reports received at the Palo Alto plant since the completion of the tests indicate that good, clear signals were obtained on all occasions. According to officials at the local factory, the Bordeaux project has more than fulfilled the highest expectations of the builders.

Characteristic of Bordeaux Station

The equipment for the Bordeaux station was designed and built in the Federal Telegraph Company's factory here in 1918 and the installation was made in France for war purposes by the United States Navy Department, which contracted with the Palo Alto company for the equipment. The government of France provided the foundations and buildings for the project. The apparatus is contained in a large power house and the overhead antennae network of copper wires is held in place by eight self-supporting steel towers covering an area of 4000 by 1400 feet. The towers are 820 feet high and weigh 550 tons each. They are the largest and best erected of any radio station in the world.

The magnitude of the Bordeaux station

may be realized when it is noted that the antennae structure is nearly one mile long.

Power to operate the station is obtained from the City of Bordeaux over a transmission line, and when operating at full power from 1000 to 1200 kilowatts of energy are necessary continuously.

Another unique feature of the station is the unusual length of the electric waves it produces. The longest wave lengths used for radio communications previously have been those employed at the naval radio station at Annapolis, Md., the equipment for which was built in Palo Alto. The Annapolis station uses a wave length of little over a mile long. The Bordeaux station, during its tests, used a wave length almost one and one-half miles long. These enormous wave lengths permitting the waves to travel for long distances have been one of the features of the performances of the Bordeaux station.

Better Service Than Cables

The field for wireless development is considered by the radio experts to be extremely promising since wireless communication presents advantages over the cable line system, being able to give better service than cables and not involving the heavy cost of cable building and cable ship maintenance.—Palo Alto "Times."

Results of Honolulu Test To Be Announced at Convention

ON SATURDAY and Sunday, November 20th and 21st, at midnight, Honolulu time, the Hawaiian Transmitting Contest will take place. Dozens of applications to partake of the test have been received of late, but it has been necessary to limit the number of contestants to fifteen in order to avoid confusion and delay.

A radiogram bearing the date of October 26th has been received from Mr. M. A. Mulrony, expert radio aide at the Pearl Harbor Naval Station, reading as follows:

"Tests arranged November twenty-first; letter follows."

Another radiogram received the same day from Mr. T. Hall states that the test will be held on the 20th and 21st at midnight, Honolulu time, and the fullest co-operation is guaranteed.

As we go to press we are still without written word from Mr. Mulrony, probably due to delays in the mail. A letter from Mr. Hall dated November 1st is at hand and he has this to say:

"I suppose you received my radio in reference to the test. I saw Mulrony and he states that he has written you. I am moving my receiver to the College of Hawaii as the induction in the business section of Honolulu is fierce.

"I will get the schedule from Mulrony this week and have wired 6EA to call me independently on the evening of the 20th and 21st as I know that I can get him.

"I will send our station log for publication in the 'Pacific Radio News'—provided that we hear anything. Let's hope for the best."

The following stations have been entered for the test:

D. B. McGown (6ZE), San Francisco (C. W.).

Hall Berringer (6BJ), Burlingame, Cal. (Spark).

A. E. Bessey, Sunnyvale, Cal. (6ZK) (Spark).

H. R. Shaw (6BN), San Francisco (Spark).

Seefred Bros., Los Angeles, Cal. (6EA) (Spark).

M. H. Finley (6PQ), Santa Ana, Cal. (Spark).

G. Arnold (6AT), San Jose, Cal. (Spark).

R. Mumford (7CU), Vancouver, Wash. (Spark).

Wm. Wood (6KL), Oakland, Cal. (Spark).

L. D. Mealer (6AK), Walnut Grove, Cal. (Spark).

J. V. Wise (6EJ), Walnut Grove, Cal. (Spark).

M. S. Jackson (6JI), (Spark).

L. Van Gorder (6OC), San Francisco (Spark).

L. F. Aufdenkamp (6SK), Laguna Beach, Cal. (Spark).

E. M. Sargent (6ZA), California Theater, San Francisco (Spark and C. W.).

The schedule for the test has been transmitted by radio from stations 6BN and 6ZE, and the contestants have been supplied with further instructions by mail. The time for the test is 3 a. m., San Francisco time, on both occasions.

The results of the contest will be announced at the opening session of the Pacific Coast Radio Convention and the winners will receive prizes on that day. The De Forest radiophone in the California Theater has also been entered for the test. The equipment is being recommissioned and every effort will be made to reach Honolulu on the buzzer and bulb. Mr. D. B. McGown expects to have a tube set in operation, and 6BN is burning midnight oil with the object of finishing his new installation several days before the contest is called. Further details will be published in our next issue.

RADIO DEVELOPMENT & STANDARDIZATION

THE AMRAD GAP

MUCH has been said pro and con rotary gaps and quenched gaps. Both gaps have been found to be good gaps, but the quenched gap has certain inherent advantages about which there seems to be considerable foggy knowledge. Briefly, the quenched gap causes the transmitter to radiate maximum energy on a single wave length reducing interference and increasing range. Further, the quenched gap is practically silent in operation even when operating at full power.

More in detail, a rapid quenching action quickly stops further discharge of the transmitting condenser after the first and most powerful oscillations have passed. Thus, the induced energy is concentrated entirely on the antenna allowing it to radiate on a single sharp wave length and preventing a wasteful re-transfer of energy back into the primary oscillating circuit, a condition almost inevitable wherever ordinary plain or rotary gaps are used.

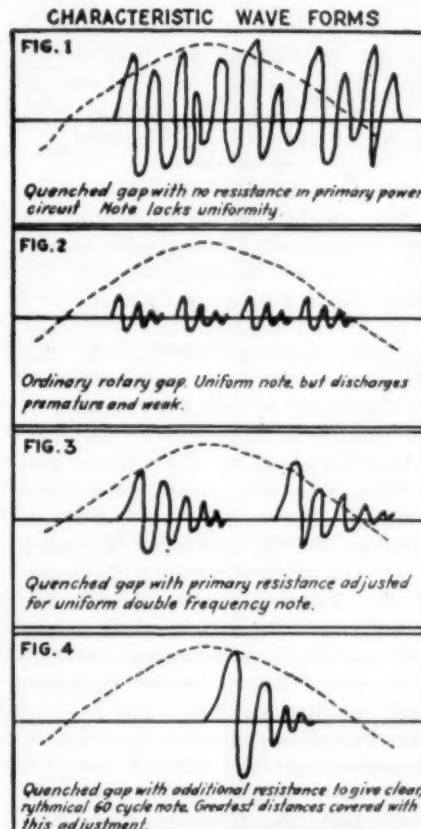
A properly designed quench gap therefore allows closer coupling. This insures a greater percentage of available energy actually put into the antenna and substantial increase in transmitting range. Moreover, the emitted wave conforms to Federal regulations respecting decrement. With a strict enforcement of the Federal regulations and the great increase of interference between stations operating on amateur wavelengths the properly designed quenched gap offers the most ready solution to a serious problem.

It has been said that a quenched gap operates best with 500 cycle current. This is not in accordance with the facts. Frequency does not affect the efficiency of the gap itself. In the case of 200 meter operation 60 cycle current is much more desirable since the slower period permits a saturated condenser charge before each train of oscillations takes place. The question has been asked whether it is possible to obtain a good spark note with 60 cycle current. The answer is "yes." A clear rhythmical note of either 60 cycles or 120 cycles frequency may be obtained by adjusting the number of gaps in circuit and the value of resistance in series with the a. c. transformer primary.

Some quenched gap sets produce a "mushy" note because the operator fails to use sufficient resistance in the primary power circuit. This causes the spark to "arc" in the gap, producing the "mushy" note. The importance of using sufficient resistance in the primary power circuit does not seem to be fully appreciated by a few operators. Figs. 1, 3 and 4 emphasize this point. Fig. 2 shows the characteristic wave form of the ordinary rotary gap.

No special knowledge is required for the operation of a quenched gap. Explicit in-

structions are included with most of the better types on the market and the operator simply needs follow these. As regards upkeep, the quenched gap has a long life for everyday use—not abuse. It is neither liable to wear out or break provided the ordinary operating instructions are followed.



THE STANDARDIZATION OF APPARATUS DESIGN

A discussion of the possibilities of standardization and its bearing on experimental radio equipment

By K. H. Stark*

WHEN a company is organized to manufacture radio equipment, or when an existing organization takes up this work, much time and money must be spent in the preliminary design of the apparatus to be sold. Once in production, any change is very expensive. Then, if it is found necessary to discontinue the manufacture of an instrument, unused special parts lay a heavy toll on the profits realized on other apparatus.

Shortly after the armistice, plans were laid for the organization of The General Apparatus Company, Inc. Before a single instrument ever went to the shop, or before there was any shop, the entire development of radio apparatus design was carefully reviewed, and, at the same time, a careful

study was made of the ideas of experimenters and their peculiar requirements.

Development of Apparatus Design

A brief resume of the methods employed by various manufacturers in this country and Europe, leading up to the present practice, is of interest.

Back, in what some of us like to call the "early days" a radio installation was hardly more than a laboratory set-up, for each instrument was an experiment in itself. The result would not now be called a receiver or a transmitter.

As time went on, instruments were developed which operated with some degree of dependability. They were fitted together on whatever kind of framework suited the ideas of the designer. These methods sufficed for a number of years. No protection was afforded to the equipment against dust and dampness. It was at this stage that the first experimental radio equipment was brought out. An amateur station was then a collection of instruments, screwed to the table or sliding around loosely, and connected by an indiscriminate net work of wires.

Probably the first enclosed receivers were those of the Marconi Company, made on horizontal panels. Adjustments protruded from all sides as well as from the top. Many credit the Emil J. Simon Company with the first vertical panel transmitter. One of the earliest vertical panel receivers was used on a U. S. Army field set.

By the first of 17917, practically all commercial companies had adopted this practice. Some experimenters were making their sets that way, too, and three or four manufacturers of amateur equipment had fallen in line.

In 1918 a new departure was seen in radio equipment. An English airplane set and a trench outfit were sent to the United States. The sets were divided into units, connected by plug and cord systems. Here was something new, but not the ultimate refinement.

Finally, at the time the G. A. Company was organized, Mr. M. B. Sleeper, who was consulted about the problem which we were attempting to solve, worked out what we now call the "five by five" system of design, better known among experimenters as the G. A. Standardized Construction.

Before going into details of this method and other points of standardization, an analysis will be given of the experimenters' ideas regarding apparatus design, collected through correspondence and conversations with many of the most active men and boys in radio work.

What Experimenters Want

To catalog for a report the ideas of experimenters on apparatus design would be as difficult as to write a book on the political opinion of the American people. No two

(Continued on page 140)

*Sales Mgr., General Apparatus Co., Inc.

DOWN TO THE
MINUTE

Current Radio News

UP TO THE
STANDARD

JAPANESE wireless interference and port discrimination against American steamers and passengers is declared to be working a hardship for Americans in the Orient, according to officers of the American steamer Ecuador, which arrived here recently from the Far East.

C. E. Dixon and R. Thornberg, wireless operators of the Ecuador, declared they find it nearly impossible to send messages ashore to Yokohama or Kobe when nearing the Japanese ports. They state their calls for recognition go unanswered by the Japanese operators, who insist in breaking their messages when communicating with other American vessels.

"I shudder to think what Japanese wireless operators would do if an American steamer in the Orient should send radio calls for assistance. Their tactics are detrimental to commerce and to safety," declared Thornberg. "They seem to take delight in garbling our messages and holding up our calls from one to four days.

"Two American girls, before arriving at Yokohama, sent a wireless ashore to a friend, in which they mentioned the name of a song. Because of the peculiarity of the song's title the Japanese Secret Service thought it was an American spy code. When the two girls arrived at their hotel they were subjected to third degree examinations while a squad of Japanese soldiers stood guard outside their hotel door."—San Francisco "Examiner."

ANOTHER record for the radio station at St. Martin's College, Lacey, Wash., was made Sept. 22. Signals from the college station were picked up by H. Paul Willis at Wichita, Kan., a distance of more than 1500 miles. Mail advices just received by the college told of the remarkable performance.

THE Shipping Board has renewed its annual contract with three radio companies, officials stated. The companies involved are the Radio Corporation of America, the Shipowners' Radio Service, and the Independent Wireless Telegraph Service.

Under the agreement which has been renewed these companies undertake to maintain the radio apparatus on the 1200 vessels owned by the board in good working order. For this they are paid \$30 a month, making a total for the fleet of \$432,000 a year. The new contracts extend for one year from October 1. The radio equipment is owned by the board and the services of the companies are to maintain it in efficient order.—S. F. "Commercial News."

AN aerial torpedo, which carries no crew, but which may be controlled hundreds of miles away by wireless, has been perfected by Charles S. Price, a prominent British aeronautical engineer.

The extraordinary craft has been successfully tested and is said to have attained speeds greater than the fastest airplane. By means of a number of delicate electrical devices, the controller of the machine is able to determine its exact location at any time during flight. The inventor has been able to use it for photography, although with uncertain results.—L. A. "Examiner."

AN agreement is reported to have been reached on the subject of the future of the great German wireless station at Eilwese, Hanover, between the German High Frequency Company and the French claimants. The Telefunken Gesellschaft also is interested in this settlement.

By its terms the French company is to be compensated by money payment, and is to be given the right to use certain German patents abroad which were in dispute. Eilwese is to be turned into a German limited company, in which the German High Frequency Company and the Telefunken Gesellschaft are shareholders. The station, which played a large part in German propaganda during the war, is to be devoted to transoceanic wireless service.

The French Compagnie Generale de Telegraphie sans Fil claimed the Eilwese station as its property on the ground that the German High Frequency Company ceded to it in 1912 the right to take the station over by December 31, 1914, and that this right had now been revived under the peace treaty.—London "Times."

THE station and operator licenses of Chas. Wilson (6LE), 3040 Benvenue street, Berkeley, Cal., have been suspended for an indefinite period by the radio inspector of the San Francisco district. Wilson was accused of sending on a wavelength of 410 meters which resulted in causing interference with commercial traffic.

WHAT is said to be the longest conversation on record, although of few words, is reported by the Bell Telephone Company in a direct communication from a ship 200 miles out on the Atlantic to the phone station on Catalina Island.

Chief Radio Operator S. W. Mitchell, of the steamer Gloucester talked by radio phone to the land telephone sta-

tion at Philadelphia; where his message was received by the land lines without relay and conveyed direct to Long Beach by way of New York, Pittsburg, Chicago, Omaha, Denver, Sacramento, Fresno and Los Angeles. At Long Beach the radio telephone to Catalina Island caught up the message without relay and carried it direct to the island station, where it was received by Chief Radio Operator E. E. Spicer at Avalon. The total distance is 4100 miles, almost one-sixth the circumference of the globe. Several amateur radio operators in Los Angeles listened in on the message and caught it with full clearness.—L. A. "Express."

A 3 K. W. Radiophone set has been installed in the stock exchange at Amsterdam, Holland. It is expected that communication with the United States will be established from this station during the evening hours.

THE International Radio Telegraph Company announces that it opened its coast radio station, at Siasconset, Nantucket Island, Mass., radio call WSC, on October 13th.

As is well known to all old radio men, this island has long been the location of commercial and naval stations and because of its particularly advantageous location will undoubtedly be very generally used by incoming European ships in getting off their traffic on long waves and at long range.

The station tax is 12 cents per word.

The station is now equipped to receive long waves, damped or undamped, with heterodyne reception and for the present will utilize spark transmitters, but general enlargements are now contemplated.

Experienced operators will be provided and this company expects to furnish the highest type of service at this station, which because of its low land line charges on most messages routed to the West will undoubtedly be one of the busiest stations on the Atlantic Coast.

PLANS have been perfected by the Navy Department for the erection of a number of compass radio stations along the Alaskan Coast, and the erection of a radio telegraph station at Cold Bay, according to F. E. Dunklee, radio engineer. Mr. Dunklee is to get certain data for use in connection with the establishment of the proposed stations during his stay here.

GUESTS on Marconi's yacht, cruising in the Mediterranean, danced to the wireless music of an orchestra playing in London.

Well, well, this opens up possibilities, doesn't it?

If you see a man and maid cheek-dancing along Main street in your village, it may be that they have suddenly caught the wireless output of some Broadway cabaret.

If Mrs. Jones of Kennebunkport drops the breakfast dishes and spends the day with Mrs. Brown at the continuous movies, it may be that her husband's dinner is preparing by fireless, conveyed from Mrs. Robinson's cooker at Yuma.

If the Reverend Mr. Psaltry rebukes your absence from the morning services, you can claim that you caught it by choirless.

Maybe blowouts and punctures will all be promptly prepared by tireless, conveyed from Akron.

And maybe, at some time in the future, political campaigns will be conducted by liarless!—L. A. "Record."

AMERICAN ships reaching ports of the United Kingdom after December 1 must be provided with wireless or risk a fine of five pounds. This is the information received by Major J. F. Dillon, radio inspector for the Bureau of Navigation. After next month American vessels in British ports will be subject to the same regulations regarding wireless as ships flying the Union Jack. The order applies to all passenger vessels and to other craft of 1600 tons or over.

EQUIPPED with a wireless telephone as a safety measure in case of emergency, making it the first vessel so equipped, the British bark Manrewi will depart from this harbor shortly.

One of the chief reasons for this precaution, it is stated, is because the vessel will carry a full cargo of California gasoline. The cargo is consigned to New Zealand and is being shipped by the Petroleum Products Company of this city.

The apparatus was installed by A. F. Pendleton. It is a complete set, including telegraph instruments, but as the bark will not have an operator in her crew only the wireless phone will be utilized.

Captain R. G. Holmes, master of the craft, looks forward to much enjoyment during the voyage across the Pacific. He declares that he will be able to listen in on all telephonic and other wireless communication between the large ocean liners and in case of emergency will be able to call out over

the Pacific for a radius of 1000 miles by his own voice.

This marks the inauguration of wireless telephones aboard sailing vessels, according to local shipping men. John D. Spreckels recently installed a wireless phone aboard his yacht Venetia.—S. F. "Examiner."

TORONTO Ont., October 15.—Preparatory to building a huge wireless station for communication between Canada and England, the Marconi Wireless Company of Canada, has purchased 23 acres of land about nine miles from Toronto. It is understood that this is the first of a chain of wireless stations with which it is expected to dot Canada and encircle the British Empire.

PROBABLY the most unusual "sandman" program ever given for a group of children anywhere took place at the Children's Hospital, when songs and music came out of the "clear sky" via the wireless telephone.

Directors Roth and Partington of the California Theater planned this treat for the little "shut-ins" through the courtesy of Ellery Stone of the Lee De Forest Radio Company. A special receiving station and Magnavox were installed at the hospital for the event.

SAN FRANCISCO'S first fog since the establishment of the United States naval radio compass bearing stations permitting a vessel to secure her bearing outside the heads, checked the Golden Gate and gave a demonstration of the new wireless signal arrangement.

According to Commander S. D. McCoy, chief of the operators at this port, the service gave very good results and proved its feasibility in assisting ships to navigate safely to anchorage in the harbor.

THE Rev. J. M. Skinner of the Presbyterian Church in Stockton, preached a sermon in a wireless telephone, which was heard at many points within a 100 mile radius of Stockton. His voice was heard at stations in six surrounding counties.

THE mascot of a certain naval radio station was a hungry looking black cat. "—and what do you call him?" asked the newly assigned op. "His ribs are of such prominence that we call him Helix," answered the chief.

VIOLIN IS PLAYED BY WIRELESS WAVE

COPENHAGEN, November 6.—A discovery which is predicted to effect a complete revolution in wireless methods was made public here when a violin was made to play and talk by wireless.

A violin was placed on a wall, while in a room some distance away a melody was played into a sending apparatus. Those present were greatly astonished when the melody automatically repeated itself on the violin. Later the human voice was transmitted, and a sensation was created when the violin repeated quite distinctly the spoken words.

The patent rights of this discovery are held by two young Danish engineers, named Johnsen and Rahbeck, who developed it three years ago. It is based on the previously known fact that certain substances, under electrical treatment, receive similar magnetic qualities.—S. F. "Chronicle."

BIG WIRELESS STATION PLANNED FOR PALO ALTO

Three big wireless stations in California, these, with one at Portland, Ore., to make up its Pacific Coast equipment for long distance transmission business, are planned by the Federal Telegraph Company. The California stations are to be at Palo Alto, Los Angeles and San Diego.

Work here is to be started as soon as permission to raise necessary funds is granted by the Railroad Commission. For this purpose the company asks permission to issue and to sell \$500,000 worth of 8 per cent serial gold notes, payable in annual equal installments of \$100,000 each.

At present the Federal is using the Pacific Telephone and Telegraph telephone lines for transmitting messages received at the South San Francisco wireless station. This contract expires shortly.

The company is handling an average of 50,000 messages a month, an increase of almost two and one-half times the business of 1917.—S. F. "Recorder."

FEDERAL TELEGRAPH COMMENDED

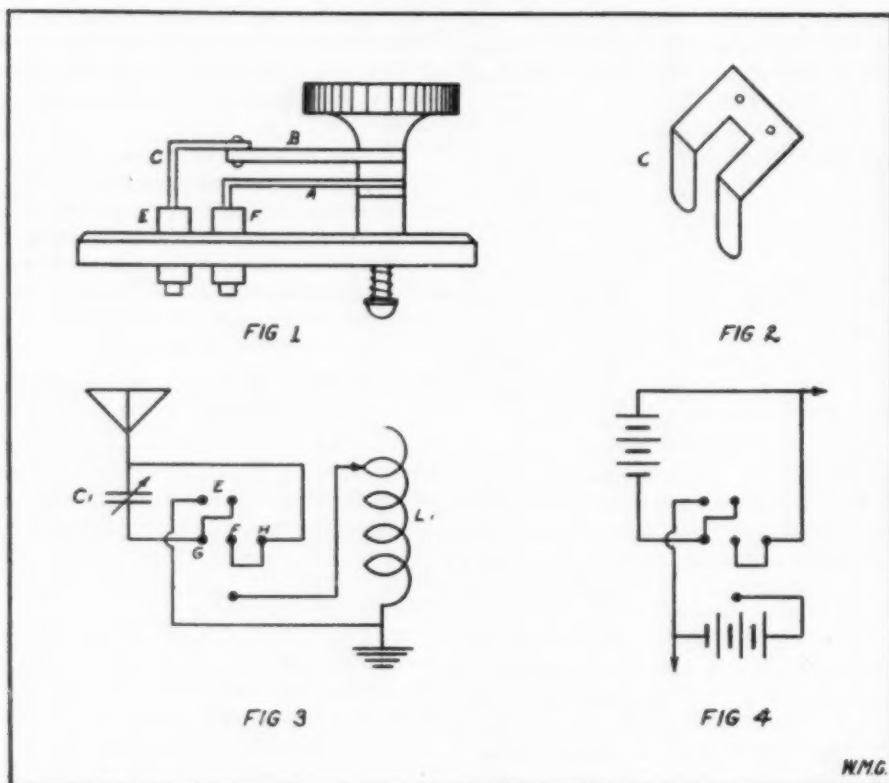
R. S. Griffin, engineer-in-chief of the United States Navy, has written to President R. P. Schwerin of the Federal Telegraph Company, congratulating the company on the excellent results obtained with the duplicate 1,000-kilowatt arc equipment installed in the Lafayette radio station at Croix d'Hins, France. Admiral Griffin says:

"The results of the thirty-day tests of this equipment, recently completed, are very satisfactory to the bureau, the comparative strength of Lafayette's signals as measured at distant stations being from three to five times as great as those received from other European high power stations and solid copy being consistently obtained not less than twenty-two hours out of the twenty-four, regardless of the periods of the day during which fading of signals occurs and notwithstanding the fact that the tests were conducted during the most unfavorable static season.

Griffin also compliments R. R. Beal of the Federal system under whose supervision the construction work was completed.—S. F. "Examiner."

A SERIES PARALLEL SWITCH

By K. Jefferson



NOT being satisfied with results obtained from the construction of series-parallel switches described from time to time, the writer has experimented with and received successful service from the switch hereby described.

By referring to Figure 1 it will be seen that the construction of the switch is quite simple. Figure 2 is a detail of one of the contacts. Figure 3 is a wiring diagram. Figure 4 is a diagram showing another use of the switch as in the case of charging batteries.

In figure 1, A is the contact arm of an ordinary rotary switch. B is a strip of insulating material. A and B must be mounted on the shaft in such

a manner as to rotate together. If the two contact points E are placed 1-8 inch apart and the slot in C is cut to a width of 1-8 inch, very good results will be obtained. The builder can use his own judgment in regard to the other essential dimensions.

Figure 4 shows a method of using the switch to divide a set of batteries while being charged. After charging, the two sets of batteries are again placed into series connection for use. A divided inductance or a pair of inductances can be used in like manner. When connected in series they can be used for increasing wave lengths, and in parallel for reducing resistance.

NEW CALL LIST ISSUED

THE list of AMATEUR RADIO STATIONS OF THE UNITED STATES is now ready for distribution and can be obtained for 15 cents from Superintendent of Documents, Government Printing Office, Washington, D. C. Stamps will not be accepted. The list contains all call letters of amateur stations issued to June 30, 1920. A similar publication, COMMERCIAL AND GOVERNMENT RADIO STATIONS OF THE UNITED STATES, is also ready for distribution and can be obtained from the above address at 15 cents per copy.

Stations copied and worked at 7AD—F. J. Brott, 10 Walk, 1 Madison Park, Seattle, Wash., September 9 to October 26, 1920.

6AAJ, (6AAT), 6AAW, 6ABP, 6ABX, 6ACR, 6AG, 6AJ, (6AK), 6AH, 6AI, 6AE, 6AN, (6BJ), 6BN, 6BQ, 6CC, 6CO, 6CP, (6CV), 6DK, 6DP, (6EJ), 6EP, 6ER, (6EX), 6FE, (6FS), 6FH, 6GO, 6GN, 6II, 6IL, 6JM, 6JN, 6JQ, 6KM, 6MZ, 6NE, 6NO, (6OH), 6QK, 6QM, 6QR, 6RQ, 6SK, 6TC, 6ZK, 6ZE.

7AE, (7AW), (7BG), (7BH), (7CC), (7CE), (7CU), (7CW), (7DA), 7DP, (7ES), 7FH, (7FO), 7FV, (7GQ) (7GY), 7HN, (7IN), 7JP, 7JW, (7YS), 7ZH.

CARDBOARD TUBES

By C. Chandless Pidgeon

HERE'S a way to knock the "H" out of the H. C. W. (High Cost of Wireless.) Cardboard tubes are used daily in the construction of coils of various descriptions. It was my desire to construct a regenerative receiver and difficulty was encountered in securing the proper size tubes. While glancing around the house I found a small Quaker Oats box, $4\frac{1}{8}$ inches in diameter, a Quaker Corn Meal box, 4 inches in diameter and a Morton's or Diamond Crystal Salt box, $3\frac{1}{2}$ inches in diameter. These tubes are of the ideal size for the regenerative tuners and couplers. A Spotless Cleanser box is three inches in diameter. The only size that I could not find was one with a four-inch diameter. I have made small loose couplers from a section of an oats box and a section of a Shaker Salt box. The tuner works very satisfactorily and I am now incorporating it in a three variometer receiving set. The tubes can be baked in paraffin or some other insulating compound for added efficiency to the finished instrument. Several coatings of insulating varnish will help to stiffen the tubes and prevent warping in damp weather.

BIG STATION TO BE ERECTED IN SUNNYVALE

THE inhabitants of Sunnyvale, California, with the exception of Mr. A. E. Bessey, are rejoicing over the news that the Federal Telegraph Co. is planning on the construction of a high power arc station at Point Sunnyvale. The cost of the plant will aggregate about \$160,000. The foundation will be laid soon as the steel frame-work is already on hand for the superstructure. The towers will be 600 feet high. Mr. Bessey (6BR) will wear the same smile on his countenance that Mr. McGowan (6ZE) wears when the beach station of the U. S. Navy "opens up" with more mush on 200 meters than enough.

NAPA RADIO CLUB HOLDS OPEN HOUSE

THE Napa Amateur Radio Club held its first open house on October 28th. The open house was a "full house" on the occasion and several interesting addresses were made. Mr. Hildebrand of the Willard Storage Battery Company spoke on the benefits of organization and Mr. Clark of the Pacific Gas and Electric Company outlined the future possibilities of electricity. Mr. M. L. Webb was the announcer of the evening and gave a practical demonstration of radio work on the club's transmitting and receiving equipment.

Arc Radio Apparatus

By Jennings B. Dow

Published by Permission of the Secretary of the Navy

PART IV.

FIG 10 shows two types of positive electrode entrances. A shows a circular disc of Bakelite having a hole through its center through which the electrode enters the chamber. To illustrate the application of the rule given above, the minimum dimensions are given. B shows another design in which a thick ebony-asbestos block is used. The use of this construction makes possible a considerable reduction in chamber volume and is a type commonly found in converters designed to use illuminating gas or other gases rich in carbon. By using several blocks, it may be seen that any possible path for leakage may be made very great.

In the design of experimental arcs, it is not recommended that the negative electrode be grounded to the chamber as is commonly the case with commercial arcs. The reason for this is quite obvious. Small arcs, as a rule, are used with coupled oscillating circuits, and the negative side is not ordinarily grounded. Grounding the negative side to the chamber would, therefore, make the chamber a live part insofar as its relation to other parts of the apparatus is concerned.

Magnetic circuit entrances into the chamber should be of approximately the same section as that of the core adjacent to the entrances.

A poppet valve should be provided to relieve the chamber of excessive pressures caused by gas explosions within it. The outlet area will, of course, depend upon the volume of the chamber and for small arcs within the scope of this article, an area of about $1\frac{1}{2}$ square inches will be found sufficient. This valve is usually a spring loaded, conical seated affair, fitted to one side of the chamber. Placing this valve in the bottom of the chamber is to be avoided, if practicable, because particles of carbon falling into it often cause sticking. It will be found convenient in most cases to install the poppet valve in the chamber inspecting manhole cover, thus leaving the bottom of the chamber available for receiving deposits of soot and other refuse which will naturally deposit there and which may be removed through an opening provided for that purpose.

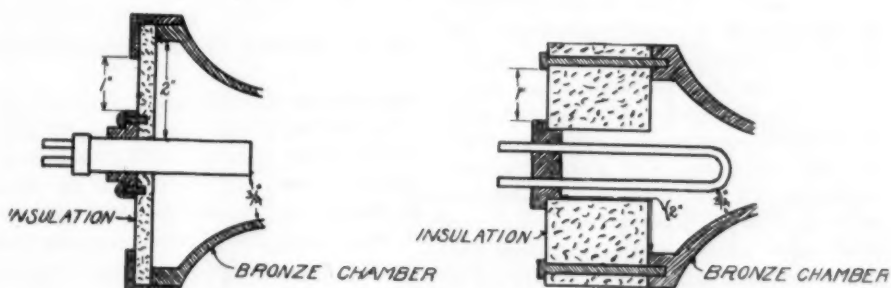


Figure 10

The electrode cooling system should be such that both electrodes benefit by it. An abundance of water should be continuously forced against the copper tip of the positive electrode during the operation of the arc. A water jacket should house the negative electrode holder also. Isolated water circulating systems are recommended for each electrode as considerable inefficiency will result from connecting electrodes electrically with a water conductor which possesses a low high-frequency resistance. In cases of larger arcs, the power consumed by this resistance is such a small fraction of the total output that this precaution need not be taken, but in arcs operating at 500 volts input and having a power output of one kilowatt, a decrease in efficiency of five per cent may result from this source. A convenient arrangement for water circulation is the use of two large bottles fitted up to discharge their contents by gravity through each electrode cooling system.

A magnetic flux density of 4000 to 8000 gauss in the air gap may be used and, in general, the efficiency of the arc will be found to increase up to the point where the 8000 gauss value is reached. If the flux density is greater, difficulty will be experienced in maintaining the arc. At this value of field strength, sudden changes in the input current or a sudden change in the amount of energy taken from the closed oscillating circuit are liable to extinguish the arc permanently and striking will have to be resorted to in order to start it again. Either the closed or open form of magnetic circuit may be used with equal success. The construction of the solenoids should be such that they will not be affected by the heat of the arc chamber or by any potential that the body of the converter is liable to possess due to leak-

age or induction. The use of spools constructed of Bakelite will eliminate the possibility of trouble from either of these sources. One quarter inch Bakelite is recommended for this purpose. If the core is circular in section, a combination of sheet stock and tubing will solve the spool problem very satisfactorily.

After the solenoids are wound, a single layer of bare copper wire or a copper cylinder should be placed over the outside layer of the winding to shield it from the destructive effect of induced currents from high-frequency leads in the vicinity.

The administering of gas into the chamber is an absolute necessity. Alcohol (denatured, wood, or grain) may be used by dropping it into the arc or upon some heating device for volatilizing it within the chamber. For small arcs, the latter method is preferred as it avoids the production of irregularities. Some designers provide a small electric heater inside the chamber upon which the alcohol is made to drop, others provide a small metal or earthenware plate, some distance above the arc and heated by it, upon which the alcohol is dropped. Ordinary coal gas as used for illuminating purposes may be administered into the chamber and used with a high degree of success, and often the arc output may be increased as much as thirty per cent by the use of this substance. When using this substance, however, great difficulty is liable to be encountered in attempting to maintain insulation for any great length of time without cleaning out the chamber. A great amount of soot forms which soon blankets all exposed insulation inside the chamber, rendering

(Continued on page 138)

THE AUDION OSCILLATOR*

By R. A. HEISING

(Continued from the November issue)

PART II.

THE operation of the oscillator is thus a cyclic one and is continuous and self sustaining as long as direct current is supplied to the audion to make the plate circuit a two-way conductor for variable currents. The operation of the oscillator may be compared to a steam engine with the grid controlling the flow of electricity as the slide valve controls the flow of steam. The alternating potential on the grid produces an alternating current in the plate circuit just as the slide valve causes steam to move the piston back and forth in the cylinder. The alternating space current produces a large oscillation current in the oscillation circuit as the piston produces a rotary motion of the driving shaft. The oscillation current in producing the original grid alternating potential by passing through L_s , corresponds to the rotating shaft producing the original to and fro slide-valve motion by means of the eccentric. The cyclic action in both is continuous and self-sustaining. The analogy, however, falls down

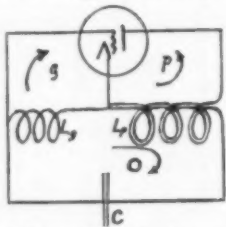


Fig. 3. Hartley Circuit Approximation.

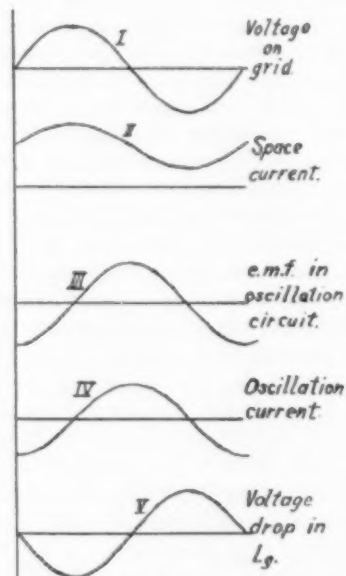


Fig. 4. Phase Relation in Hartley Circuit.

in that the frequency in the audion oscillator is determined by the circuit, while the steam engine it is determined by the

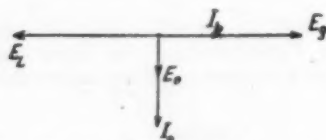


Fig. 5. Hartley Circuit Approximation.

load and steam pressure.*

In explaining the phase relations in an oscillator, the resistance will at first be assumed as zero and the circuit as shown in Fig. 3. L_p is shown drawn in two parts to make the paths of the alternating space current and oscillation current separate. This circuit consists of three meshes or complete circuits, grid, plate, and oscillation. They are indicated by the letters g , p , and o . Positive-current directions are assumed in each circuit and are indicated by arrows. The directions in the grid and plate circuits are so chosen that a positive voltage in the grid circuit (which raises the grid potential) causes a positive current to flow in the plate circuit. An increase in the grid potential of an audion causes the space current to increase, and with the direction assumed in the plate circuit as positive, the increase in space current is a positive current. When a positive current flows through inductance L_p it is flowing through an element which is also part of the oscillation circuit and the direction assumed as positive in the oscillation circuit is such that the positive plate current is also a positive current in the oscillation circuit. When a positive oscillation current flows through inductance L_s it flows through an element which also belongs to the grid circuit. A current flowing through L_s in the direction indicated by the oscillation circuit arrow is a positive oscillation current but when referred to the arrow in the grid circuit, it is a negative current. The current although flowing in the direction of the arrow in one circuit flows in the opposite direction to the arrow of the other circuit. This must be kept in mind in the following description because it means that a voltage or current in L_s which is positive while considered as in the grid circuit and vice versa. This means that an alternating voltage or current in the oscillation circuit must be given at 180 deg. shift, or reverses, if we wish to talk about it in the grid circuit.

In Fig. 4, Curve I represents the alternating voltage applied between the grid and the filament. This voltage causes the alternating space current, Curve II to flow. In flowing through L_p the alternating space current produces an e. m. f. 90 degrees behind it (shown in Curve III).

This in turn produces an oscillation current (Curve IV) which is in phase with it on account of the frequency being the resonant frequency. The oscillation current in flowing through L_s produces an e. m. f. 90 degrees out of phase (Curve V). This e. m. f. transferred to the grid mesh of which it is a part must be given an opposite sign (for reasons stated before) and it is then observed to be the original voltage applied to grid.

6. Simple Vector Diagram

The phase relations are shown in the Vector form in Fig. 5. The grid voltage is E_s . The alternating space current is I_o . The voltage produced in L_p by I_o is E_o and this produces the oscillation current I_o . The latter in flowing through inductance L_s produces the voltage drop E_L . This because of oppositely assumed positive directions in meshes g and o must be reversed and is the grid voltage E_s .

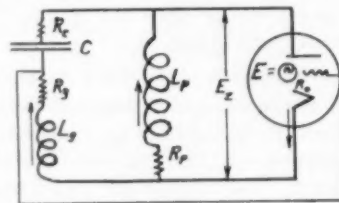


Fig. 6. Rearrangement of Hartley Circuit showing positive directions assumed in various branches.

7. Vector Diagram Including Resistance

In previous explanations the assumptions were made that the oscillation circuit resistance was zero, and that all the plate alternating current passed through the inductance L_p . To show the relations in the actual circuit it is preferable to arrange the circuit as shown in Fig. 6 with the positive directions in the branches (instead of in the circuits) indicated by the arrows. The plate and grid inductances are assumed to have no mutual between them, and each element of the oscillation circuit has its own resistance.

The elements of the oscillation circuit as arranged are called the external circuit to distinguish them from the internal circuit of the audion. Such an arrangement of inductances and capacity has a reactance-frequency curve, as measured between the points connected to the plate and filament, of the form shown in Fig. 7. The resonant frequency for the oscillation circuit as a series circuit occurs at " r " which is at or near the point at which the reactance of the parallel arrangement changes sign. The frequency of oscillation in this type of circuit always occurs just below the resonant frequency on account of the resistance in the circuit elements. This

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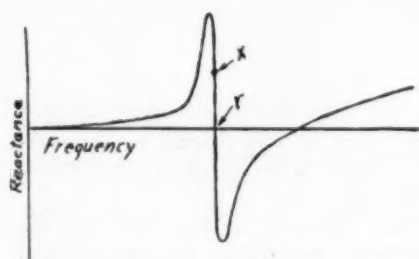


Fig. 7. Reactance of External Circuit of Fig. 6 as a Function of Frequency.

shown analytically, and can be proved by the vector diagrams. The external circuit will therefore have an inductive reactance when attached to the audion as an oscillator. The circuit is looked upon as an external circuit in series with an audion which contains a fictitious generator of voltage E and internal resistance R_0 . The voltage of the fictitious generator is μE_g where E_g is the voltage applied between grid and filament and μ is the amplification constant of the audion.²

In Fig. 8, the voltage applied to the grid is E^g . The fictitious plate circuit generator voltage is then $E = \mu E_g$ and is in phase. Due to the inductive reactance of the external circuit, the alternating space current I_b lags. The alternating space current in flowing through the external circuit produces a resistance drop $I_b R$, where R is the external resistance, and a reactance drop of $I_b X$, where X is the external reactance. Attention is here called to the fact that voltage drop $I_b R$ is opposite to the direction in which I_b flows, and $I_b X$ is 90 deg. behind I_b . This is not according to a conventional method used by some engineers but it agrees strictly with Faraday's law of the sum of the e. m. f. in a closed circuit being zero. The two counter e. m. fs. produced by I_b add up into the external counter e. m. f., or drop, E_a , an e. m. f. produced entirely by I_b . Equal and opposite to E_a is the e. m. f. E_s which is that part of E which is consumed by E_a . Within the audion I_b produces another resistance drop E_s also opposite in direction to I_b . E_s added to $I_b R$ and $I_b X$ produces a counter e. m. f. equal and opposite to E making the sum of the e. m. fs. in the circuit zero. The voltage applied to, and across the external circuit is then E_s which is equal and opposite to the external drop E_a . It is the driving voltage for the external circuit. The external driving voltage applied across inductance L_p causes a lagging current I_p (Fig. 9) to flow. It is less than 90 deg. behind E_s because of resistance in L_p . E_s also causes a leading current to flow through the other arm $C + L_s$ which is almost 90 deg. ahead (I_s). The sum of the two currents is I_b the alternating space current. I_p is larger than I_s because the operating frequency is below the resonant value and the inductive

reactance of L_p will then be less than the capacitive reactance of $C + L_s$. The current I_s in flowing through the inductance L_s produces a resistance drop A and a

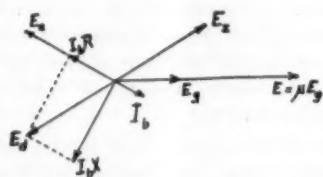


Fig. 8. Vector Relations in the Hartley Circuit.

reactance drop B . The sum of these is E_s the voltage applied to the grid.

The impossibility of this circuit operating above resonance can be shown from Fig. 9. The grid voltage E_s must always be in phase with E as $E = \mu E_g$. E_s is the vector sum of A and B which are voltage drops in L_s . I_s will be just 90 deg. ahead of E_s if the resistance of L_s is zero, but any resistance in L_s produces the drop A and I_s is forced more than 90 deg. ahead of E_s . Then, as I_s is a leading current produced by E_s it can be 90 deg. ahead of E_s if the total resistance in C and L_s is zero, but with resistance the angle is reduced and E_s must be moved closer to it and ahead of E_s . Stated in a few words

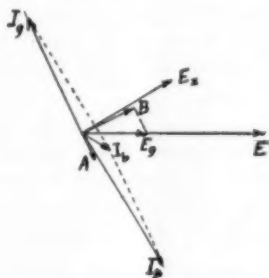


Fig. 9. Vector Relations in the Hartley Circuit.

we can say: (1) the angle between E_s and I_s must always be over 90 deg., (2) the angle between I_s and E_s must always be less than 90 deg., therefore E_s must always be ahead of E and E which means an external circuit of inductive reactance and (from Fig. 7) a frequency below resonance.

8. Vector Diagram With Mutual Inductance Between L_p and L_s .

Fig. 10 is a vector diagram like that in Fig. 9 as regards voltages, currents and notation. If there is mutual inductance between L_p and L_s , the current in L_p produces an e. m. f. in L_s which is either e_1 or e_2 depending upon whether the mutual inductance is negative or positive. By a positive inductance is meant a coupling such as to make the total inductance in the oscillation circuit greater—that is $L_0 = L_p + L_s + 2M$. If the mutual is positive I_p



Fig. 10. Influence of Mutual Inductance on Phase Relations.

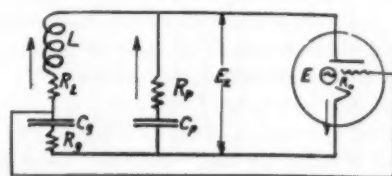


Fig. 11. Rearrangement of Colpitts Circuit showing positive directions assumed in various branches.

produces the e. m. f. e_2 which when added with A to B produces the vector P_2 as the grid voltage. This position cannot obtain as the grid voltage must be in phase with E . To get this, all vectors except E must rotate slightly to the right which means that the external inductive reactance is smaller in proportion to the resistance and that the frequency is nearer the resonant frequency. If the mutual inductance is negative, I_p produces the e. m. f. e_1 in L_s and it with A added to B produces the vector P_1 for the grid voltage. For P_1 to coincide with E , all vectors except E must rotate to the left. A negative mutual in-

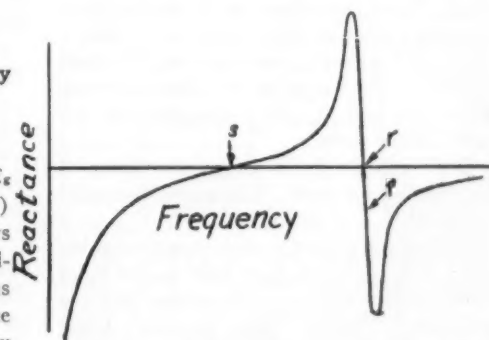


Fig. 12. Reactance-Frequency Curve for External Circuit in Fig. 11.

ductance reduces the voltage applied to the grid, and increases the external reactance, thereby causing the oscillation frequency to drop farther below the resonant frequency. A negative mutual inductance makes the oscillator less likely to oscillate than a positive value.

(To be continued)

²Nichols, *Physical Review*, August, 1917, and June, 1919.

A CHANGE OF HEART

By F. S. JENKINS

THE day before Christmas was raw and blustery with flurries of snow in the air, and the evening was colder yet with great gusts of frigid wind playing hide and seek around New York's gloomy canyon-like streets.

Old Ben Collins was hurrying up Warren Street on his way from work, to home and a hot supper. He was a crusty individual, full of Q. R. N. of the grinder and growler variety. Buttoned tight in his shiny great-coat and with a rusty derby jammed down on his head, it would be hard to imagine him the famous editor that he was.

Glancing in a brightly lighted store window, his eye was attracted by a peculiar array of articles for sale. Near by, stood a young man of jovial countenance, gazing interestedly at the assortment. Under his arms were two large packages.

Halting in his stride and stepping nearer, Ben's sharp eyes roved over the display. Finally, his curiosity getting the better of him, he inquired: "What's all this junk, young man?"

The "young man," turned toward his questioner and with a smile exclaimed: "Junk! That's no junk. Those are instruments for amateur wireless."

"Well that's junk all right," grumbled Collins. "There's one of those young idiots up on my street, with a lot of wires hoisted above his house. Dem fool makes all the lights in my place blink when he monkeys with his crazy contraption. Sits up till all hours annoying the neighbors. Ought to be a law against 'em, I say."

The young man's expression slowly changed from a smile to a frown at this tirade. As the gruff voice finished, he replied: "Say, listen here sir, if you've about ten minutes, I know a little story that I think will change your opinion of these amateurs. Just step in this doorway here, where it's not so cold and windy and I'll spin you the yarn."

Ben's appetite for news got the better of his appetite for food. "I'm from Missouri," he growled.

Lighting a cigarette, the young man began: "Long about four bells in the third watch, on the evening of December 19th, the freighter 'Pontya' was plowing along through a fifty mile gale off Atlantic City. The wind was off the port quarter and with a heavy deck load and a cranky turbine, she was making heavy weather of it. Finally the plates on number one hold, no longer able to stand the strain, began to start, and large volumes of old Neptune's kingdom poured in. The storm increased in violence and the plates continued to open. The bulkhead began to give and to make matters worse, the turbine on the port screw failed entirely. At last matters got so bad the 'old man' ordered 'Wireless' to send out a call for help.

"Now you probably don't know, sir, but

it's a fact, that in the ether, there are so-called 'dead spots' dreaded by all sea-going radio men. Through these spots radio waves can seldom pass. Signals can sometimes be exchanged with one station, sometimes two, sometimes none at all. This will explain what follows:

"Down on the coast of New Jersey, about a half mile below the Nantoloking Coast Guard Station, lives a little crippled chap named Tom Binny. His father is an old fisherman of little ambition, so consequently the family's circumstances are very meager. Due to the isolation of his home and his useless leg, the poor kid has practically no playmates. He is of a scientific turn of mind and so, due partly to this reason and partly on account of his loneliness, he started to dabble in wireless. The mild interest soon became intense and he spent every cent he could get on parts and instruments. He had little enough to spend, Lord knows, but he finally evolved a receiving set which for looks was nil but for works was good up to eight hundred miles in daylight. He had to content himself without a sending set as no city current was available and storage batteries were too expensive.

"On this same evening of December nineteenth, he had been listening in as usual to the busy ship traffic up and down the coast. His father was over visiting a neighbor and his mother was down at the village buying their frugal supplies, so he had a quiet evening all to himself.

"Long about five bells he decided to turn in. He laid his phones down and reached for the canvas to cover the beloved set when, clear as a bell from the receivers on the table, came the electrifying call of the spark:

"Sos sos sos de kypz in distress 59 miles east Point Pleasant forward hold flooded turbine disabled need help at once will take to boats in two hours.

"Jamming the phones back on his head, Tom feverishly scribbled down the words as they hurtled through the ether.

"Again and yet again the cry for help rang in his ears, yet the radio traffic of ship and shore station alike continued on, undisturbed.

"What was wrong? Why didn't they answer? These thoughts flashed through his mind as he nervously tuned up to catch a reply.

"All at once the answer dawned on him. The disabled ship was in one of those dead spots he had read so much about and he was evidently the only one who had heard the call.

"There was only one thing to do. He must hobble at top speed to the Coast Guard Station at Nantoloking and give the alarm.

"Catching up his crutch and the scribbled message, he stumbled out the door and up the beach as fast as his one good leg would

take him. Over and over he kept repeating as he fought his way through the icy darkness: 'Oh God, let me be in time! Please let me be in time!'

"What with the shifting sand and the bitter wind, his progress became more and more feeble, until at last, as he reached the station gate he sank down exhausted, unable to go a step further.

"Five minutes later, one of the guards, coming from the boat-house hard by, stumbled over the little huddled body and carried it inside. Tight clasped in his hand was the message.

"For the next fifteen minutes, the wires to New York and Philadelphia were humming with the report of the disaster, and an hour later the 'Pontya's' crew, officers and men, were safe aboard the Revenue Cutter 'Senapa.'

"Eh? Oh Tom's coming around all right. Still in bed from the effects of his trip, but getting better every day."

"Is it a true story! It sure is! I'm the opp. that sent the SOS and this here," indicating the packages under his arms, "is the finest receiving set I could find. The crew of the Pontya bought it and I'm delegated to go down and present it as a Christmas gift. Guess the kid won't be tickled, eh?"

"Huh!" retorted Collins, in a low tone, "Still think it's junk, but," fumbling in his pocket and pressing a fifty dollar note into the operator's hand, "Here, maybe the kid will need a dingus, or something, that you've forgotten."

CRITICISM ON LOWENSTEIN EQUIPMENT IS ASKED

Brooklyn, N. Y.,
Nov. 10, 1920.

Paul R. Fenner, Editor,
Pacific Radio News,
50 Main St.,
San Francisco, Calif.

Dear Sir:

The Lowenstein Radio Company, Inc., 397 Bridge street, Brooklyn, N. Y., have manufactured a number of radio transmitting sets for the U. S. Navy, which have been in service on American ships for some time. Being desirous of hearing from the operators who have used a Lowenstein set, we take this means of communicating with them through your good offices. What we want is honest criticism from the man on the job, so that we may be guided by him in our future work.

We shall be glad to hear from any operator who has used one of our sets.

Very truly yours,
LOWENSTEIN RADIO CO., INC.
G. H. Lewis.

REPELLENT RADIO

By HERBERT WARREN DODGE

OLD FERRIS glanced up at his son Jack, and muttered, "Guess it's all off, boy. They wouldn't even offer to try out the invention." He ceased speaking and bowed his head in his hands.

"That's all right, dad," replied Jack Ferris, "I'll take the apparatus down to Johnson, of the Airway Express Company, tomorrow. I know he will listen to me, as we attended college at Berkeley together. He's a fine fellow," concluded Jack.

"Well, Jack, I hope he appears in favor of the appliance. It certainly would be of extreme advantage to his company if he decided to install it on his airplanes."

The device referred to was a rather compact box, at that moment resting upon the table before Jack. The cabinet contained his father's invention, the "repeller." Delicate instruments controlled by radio were inside the box, representing years of experimenting and testing. Although a patent had been issued, Ferris could interest no radio company in San Francisco with his invention. All were too skeptical to believe that radio could be utilized to actually repel any other object containing an antenna and radio instruments.

However, Tom Ferris was ready to prove all he had said his contrivance would do. But the prominent radio companies could not be bothered by "cranks," and deaf ears were turned to him.

"Here it is nearly Christmas," mused Ferris, "and I was hoping—yes, praying, that someone would purchase the 'repeller' so we could buy that little home out in Sunset that Mary was admiring. That would be a nice Christmas present, but I guess there's no use talking about it. Five thousand dollars is a lot of money," he ended with a sigh.

"Yes," said Jack, "mother is in love with that little cottage. Well," he added hopefully, "Johnson may buy the invention."

"I earnestly hope so," responded his father dejectedly.

At nine o'clock the next morning Jack Ferris was in consultation with his college chum, Fred Johnson, manager of the Airway Express Company.

"Jack," said Fred slowly, at the end of a half hour, "your proposition seems O. K. to me, but we'll have to test it out and see if it is as true as you say. Let's go out to Warner Field now; the *Eagle* is in the hangar, and we'll try it out on her." So saying he rose and made his way to the street, Jack following with the precious apparatus

under his arm.

Soon they arrived at the field near the ocean and the *Eagle*, a super-plane, was wheeled out.

A problem confronted them: Upon what would they test out the "repeller"? Certainly another plane could not be used, as there was too great a risk of wrecking it with the powerful action of the "repeller."

Johnson, ever-alert, said: "I've got it! Wait a second," and with that he entered the hangar and in a few minutes drove out an automobile with a fan-shaped antenna erected on top.

"Friend of mine used to be interested in radio-automobiles," he explained, "and he put a set on this one. He's out to sea now, so we can use it," he continued.

The *Eagle* was also fitted with modern radio apparatus and Jack connected up the "repeller" and they left the ground, first having turned on the filament of the audion detector in the automobile and stationing a man to watch it.

"Now!" said Jack when they were at a height of a thousand feet. He pressed the key and a low purring sound seemed to come from the box.

"The work is all over," explained Jack. "Let's land now and see whether the auto moved backward or not."

When the *Eagle* came to a stop the man left in charge of the radio-auto ran up to them and said: "Say, Mr. Johnson, a funny thing just happened while you were up there. The old flivver suddenly began to go backwards and a humming sound seemed to come from those radio instruments. I can't make it out; the engine wasn't even going," he said mystified.

"Yes?" inquired Jack eagerly. "Well, Fred, I guess that convinces you?"

"It does, Jack, and I'll take a week's option on the invention and install it immediately on the *Eagle*. And, by the way, I think I'll require your services as radio operator, too."

II.

STEAMSHIPS are not the only vehicles of locomotion that send their position reports by radio. Seven o'clock that evening Jack Ferris sat in the radio room of the *Eagle* with the receivers on his head listening to the station at San Francisco working a ship in the Pacific.

"*Airplane Eagle, S. F., for Seattle, 50 miles north of Sacramento at 8 p. m.*"

"*Sig. Williams, Pilot.*"

This was the message Jack transmitted to the government station at San Francisco when that operator had con-

cluded with his message to the ship.

The *Eagle* had left that afternoon for Seattle with a special consignment of gold. The Airway Express Company was called upon to deliver the cargo because of the rapid means of transportation. Carrying gold was unusual and the pilot expressed his reluctance to Ferris.

A few miles north of the Capital a heavy wind was encountered which slowed up the *Eagle* considerably and forced her to attain higher altitude.

Jack was still listening at midnight and was surprised to hear abnormally loud signals in his receivers. Furthermore the station was calling the *Eagle* and throwing in the dynamo switch he answered them.

The message he copied was as follows: "*Airplane Eagle. Stop immediately and land or we will open fire on you.*"

That was all! What could it mean? Hastily making his way to the pilot room he showed the message to Williams.

"I knew it!" exclaimed the pilot, "some other machine following us in the air intending to steal the gold shipment. I didn't like to leave San Francisco with such a cargo, but they wanted it in Seattle by tomorrow. We haven't even a rifle!" he said ruefully.

So that was it! Jack, with a pair of night glasses to his eyes, discerned another plane about a half-mile away following them.

Back in the radio room Ferris listened again for the other plane. Only a few amateurs in California could be heard.

The "repeller"! It dawned upon Jack like a flash. He would wait until the hostile craft drew nearer, then he would direct his apparatus upon the plane and press the key—

He could conceive the effect of the powerful instruments. At such a height it would mean sure death to the crew of the bandit airplane unless the pilot could save the machine from falling by manipulating the rudders.

Again the plane was calling the *Eagle*.

"We are only a quarter of a mile from you. Stop and land!"

"We are bound for Seattle," flashed Jack, "and intend to get there as soon as possible."

The other plane did not answer by radio, but it did by a shot which snapped a stay-wire. The next bullet pierced the wall of the radio cabin and lodged itself in the wood above Jack's head.

"That was close," muttered Ferris, "they must be very near. Guess it's time for action."

He made an adjustment to the "repeller" and, making sure everything was ready, pressed the key. The purring again sounded and all was still. Back in the pilot room Jack and Williams saw the other craft descending rapidly.

"I wonder what's the matter with him?" asked the pilot. "I thought it was the last of us when he opened fire."

Jack explained the device used to repel the other machine. At his instruments he called the station at Eureka and told the operator to inform the authorities and have the would-be bandits apprehended—they had landed near the border of California and Oregon.

III.

WHEN the *Eagle* arrived at Warner Field after having safely delivered the gold cargo, Jack was met by Fred Johnson, who seized his hand.

"Congratulations, Jack!" he greeted him. "You saved the cargo of the *Eagle* by the use of your invention and caused the other aviators to be arrested. They were a gang of air highwaymen holding up planes and robbing the occupants. That's sure a great invention and I am going to install it on all my planes."

"So they didn't wreck themselves when they fell?" inquired Jack, speaking for the first time.

"No," answered Johnson, "they landed right side up and were held by the police of Concord, Oregon, as suspicious characters. Then when the wireless reports from Eureka were flashed out they were arrested and brought here. They'll get a good long term at Folsom, I'm thinking."

"So you think the invention is worthy?" asked Ferris.

"Yes," affirmed Johnson, "what is your price?"

"Five thousand for the exclusive rights and patent," declared Jack immediately, his mind on a little cottage in Sunset.

"All right," agreed the man of business, "step inside while I make out the check."

* * * *

It was Christmas Eve in a little home in Sunset District. Jack Ferris and his mother and father sat before the open fireplace listening to the pouring rain and howling wind without.

"Satisfied, mother?" asked Jack softly.

"You know I am, dear boy," replied Mrs. Ferris with tears in her eyes.

For a long time they sat quietly. The little clock above the fireplace broke the stillness of the room by announcing the hour—midnight.

When the last stroke ceased Jack went to his mother and with arms around her said, "MERRY CHRISTMAS, mother!"

DO YOU KNOW

THAT in a transmitting tube circuit a grid leak is absolutely essential, and that it must be of the right resistance or the tube will not oscillate properly?

THAT a 220 volt D. C. shunt wound motor, running at twice its normal rated speed, will serve as a source of plate potential for that tube set you are building?

THAT the voltage output of this machine will be about 400 volts?

THAT it is essential that the commutator be kept clean when a motor-generator set is to be used for a tube transmitter if all humming is to be eliminated?

THAT a pure undamped wave for amateur work will carry much better than a spark, but that special means are usually necessary to receive it?

THAT Government equipment designed to receive undamped signals on short waves is provided with a "Rotary Tone Condenser," which is a specially constructed condenser resembling a rotary spark gap in appearance, which is rotated by a small motor. The condenser is connected across the secondary of the receiving tuner, and when rotated at the proper speed increases or decreases the secondary capacity in such a manner that a 500 cycle note is obtained from the received undamped signal?

THAT a number of perfectly good spark sets will be sold for a song because the owners are building tube sets?

THAT this may be years from now—judging from the time that it takes some of the builders to complete the sets?

THAT the filament of a power tube must always be lighted to full brilliancy before the plate current is applied?

THAT neglect of this will often cause the burn-out of all tubes in use?

THAT when using a wavemeter with a hot-wire indicating meter to measure the wave of a tube or other undamped transmitter care must be taken to go up and down the wavemeter scale slowly or the resonance point may be passed over entirely and no readings obtained?

THAT it will be an honor as well as a souvenir to take home a commercial license issued to successful candidates by the Radio Inspector at the Radio Show of the Convention?

Your Classified Advertisement in "Pacific Radio News" will reach the class of amateurs who need apparatus. Don't throw your old apparatus away—there may be a dozen of our readers who are looking for the very instruments that you no longer need.

WHAT OUR READERS WANT TO KNOW

Portland, Oregon,
November 3, 1920.

Editor "Pacific Radio News,"

San Francisco, Cal.

Dear Sir:

In your November issue I notice a letter from amateur 6BJ in regard to the strength of his signals received by many Pacific Coast amateurs. I have heard 6BJ many times and must say that he sure rolls in on a single bulb. But say, Editor, O. M., how much power is this gentleman using? Is that the secret of those "ton 'o brick" signals? Would like to know exactly how much power said station was using prior to September 1st.

Another thing: Why under the sun are all the best part of the "sixers" starting to use these double action keys? Don't we have enough trouble receiving now, with fading signals, QRM, QRN and other things without these "ops." with a double action hacksaw blade slinging a bunch of guff at us in some double-jointed manner? Really, Editor, I would like to hear the opinion of the brotherhood on these keys and their use. Remember—I am speaking of the home-made variety resembling a rebuilt corset steel or hacksaw blade and not the Martin Vibroplex or any other standard speed key. A good Vibroplex or speed key in the hands of a man who knows how to use it is indeed worth while, in fact I believe that the world's record in wire telegraphy was made with one of these keys. This shows their worth, but I'll wager the operator has practiced with it for many moons before he made that record—73.

TEN-NIN-O.

It's not the key that makes the fuss—it's the operator who is using it. 6BJ swears on a stack of Bibles that he has never used over a half k. w.

THE Admiral Line steamer President the first mercantile vessel on the Pacific to be equipped with wireless, will also be the first to have the wireless telephone installed. The Radio Corporation announces that this system will be installed in the near future.

CALLS HEARD BY 6EB

(6AH), 6AJ, 6AM, (6AN), 6BB, (6BN), 6CP, 6CV, 6DP, (6EX), (6FE), 6GO, 6HK, 6HQ, (6JN), 6KL, (6PR), (6QR), 6SK, 6TC, (6ZK), 7GQ and KIX.

UNLISTED SECURITIES

San Francisco, November 10, 1920.

Stocks

	Bid	Ask
Moorhead	12c	.....
National Radio	19c	25c
Poulsen	2 3/4	.....

SIXTH DISTRICT AMATEUR STATIONS—Continued.

Call	Name	Address
6ADV	R. W. Hickman	440 N. Washington Ave. . . Whittier, Cal.
6ADW	A. McDonald	1376 Washington St. Los Angeles, Cal.
6ADX	F. G. Beck	417 C Street Wilmington, Cal.
6ADY	S. Ayres	51 Third Street San Francisco, Cal.
6ADZ	Electric Lighting Supply Co.	216 W. 3rd St. Los Angeles, Cal.
5AEA	W. P. Bell	1807 Alameda Ave. Alameda, Cal.
5AEB	A. M. Fontaine	4127 Woodruff Ave. Oakland, Cal.
5AEC	O. Bernhard	Boy Scouts' Camp San Francisco, Cal.
5AED	S. Griffin	1825 Fourth Street San Diego, Cal.
6AEE	W. W. Grundell	1911 Eddy Street San Francisco, Cal.
5AEF	P. E. Parker	420 E. Chapman Ave. Fullerton, Cal.
5AEG	N. B. Wells	2827 Union Street San Francisco, Cal.
6AEH	E. L. Albright	2331 University St. San Diego, Cal.
5AEI	H. Blackman	Winton, Cal.
5AEJ	H. Lane	53 Cambridge Way Piedmont, Cal.
5AEK	C. Harris	454 17th Ave. San Francisco, Cal.
5AEL	T. A. Cutting	67 First St. Campbell, Cal.
5AEM	P. T. Scott	Rt. 2, Box 177A. Fullerton, Cal.
5AEN	O. C. Frei	Tolenas, Cal.
5AEO	F. Lopez	4001 Porter Street Oakland, Cal.
5AEP	S. Lassen	1472 85th Ave. Oakland, Cal.
5AEQ	Polytechnic High School Science Dept.	First Ave and Frederick. San Francisco, Cal.
6AER	R. Walker	1712 Russell St. Berkeley, Cal.
6AES	M. L. Hoffman	432 Walsworth Ave. Oakland, Cal.
6AET	C. Schonmaker	199 Douglas St. San Francisco, Cal.
6AEU	Leo J. Meyberg Co.	428 Market St. San Francisco, Cal.
6AEV	R. W. Hart	30 Grand Ave. Oakland, Cal.
6AEW	S. Armfield	Woodland, Cal.
6AEX	F. Crowl	1813 Parker St. Berkeley, Cal.
6AEY	F. W. Pratt	550 N. 17th St. San Jose, Cal.
6AEZ	G. J. Quillinan	2246 Lincoln Ave. Ogden, Utah
6AFA	R. Wall	1211 E. 23rd St. Oakland, Cal.
6AFB	R. T. Rafeal	33 Fifth Ave. San Francisco, Cal.
6AFC	A. L. Alderman	1091 Harrison St. Santa Clara, Cal.
6AFD	R. W. Baker	1983 South Ninth East St. Salt Lake City, Utah
6AFE	Boy Scouts' Troop No. 1	National City, Cal.
6AFF	Boy Scouts' Troop No. 18	San Diego, Cal.
6AFG	Boy Scouts' Signal Headquarters	San Diego, Cal.
6AFH	H. M. Ellis	1524 S. California St. Stockton, Cal.
5AFI	G. Green	211 Ellen Ridge Ave. Los Gatos, Cal.
5AFJ	H. G. Hopkins	Rt. 2. Yuma, Arizona
5AFK	E. Newton	1161 Benton St. Santa Clara, Cal.
5AFL	O. D. Packard	1428 Olive St. Paso Robles, Cal.
5AFM	University High School Radio Club,	48th and Webster Sts. Oakland, Cal.
6AFN	W. T. Rathbun	330 Fourth St. Colusa, Cal.
5AFO	B. B. Ellis	343 24th Ave. San Francisco, Cal.
6AFP	G. W. Harriman	2500 Irving Ave. Clifton, Arizona
5AFQ	J. F. Ives	Alameda, Cal.

Corrections from previous lists, correct to read as follows:

5HN	P. E. Birlew	2515 Le Conte Ave. Berkeley, Cal.
6IK	F. A. Brandis	1039 Merced Ave. Berkeley, Cal.
5FV	C. A. Peregrine	866 32nd St. Oakland, Cal.
6IY	J. J. Mahler, Jr.	116 Polk St. Napa, Cal.
5QN	K. Barbier	4225 Terrace St. Oakland, Cal.
5PC	L. W. Packard	1121 Bresee Ave. Pasadena, Cal.
6UB	E. A. Portal	Los Altos, Cal.
6AAW	A. Woolf	1708 Grove St. Berkeley, Cal.

RADIO CLUB DIRECTORY

Published every month. It keeps you posted on important meetings.

United Radio Telegraphers' Association, Pacific Coast Division—Rooms 418-420, 24 California St., San Francisco Cal. Phone Douglas 706. All commercial operators eligible for membership. Address communications to above address.

San Francisco Radio Club, Inc., S. F. Gymnastic Club, Sutter and Divisadero Sts., San Francisco, Calif. Meetings every Tuesday evening at 8:30 P. M. Visitors welcome at any meeting except first meeting of the month. Initiation fee \$2.50. Monthly dues 50c. For experimental and commercial radio operators, address communications to the secretary. —adv.

The EDITOR'S MAIL BAG

Our Readers Are Invited to Send Contributions for Publication in this Department.

Pacific Radio News, 50 Main Street, San Francisco, Calif.

Gentlemen:

7YG—Oregon Institute of Technology of Portland Y. M. C. A.—broadcasted election returns for the benefit of amateurs on the night of November 3rd.

The estimate of the 600 stations (licensed and receiving only) of the Seventh Naval District within range is, of course, low because it is known here that many six-stations as far south as Los Angeles heard us, though, of course, our local election returns did not interest them greatly.

7YG used a 2KW, Simpson type, 500-cycle Transmitter of Kilbourne & Clark Co. manufacture, on 330 meters. Power in put used was 1 KW and the radiation was but 10 amperes. The decrement was .055 so that the signals carried well and this decrement permitted local stations to work easily on 200 meters.

A great deal of interest was shown among amateurs in their "hamming" after each report. Several requests for "repeat" came back but this was impossible because of the volume of work to get out.

It was tried as an experiment and the appreciation shown has induced us to lay plans for a 15-minute local press service every night at 9:30 p. m. when news of interest, especially to the Northwest, will be available to amateurs before they could obtain it from the morning papers.

We will advise you when these plans are complete and would appreciate your announcing it in your columns then more definitely. Very truly yours,

A. J. TWOGOOD,

Dean, Engineering Schools.

Oregon Institute of Technology,
Portland Oregon, Nov. 4, 1920.

Vancouver, Washington,
September 30, 1920.

Editor, "Pacific Radio News":

Just to let you know that your magazine is very much appreciated in this locality. In particular I would like to compete in the contest for transmission to Honolulu. My opinion is that whether or not the test will prove satisfactory will depend largely on weather conditions.

It seems that whenever a test is mapped out for a definite date, especially a long distance test, the weather conditions always fail to co-operate. However, I am willing to try my luck at it. Please tell Mr. Mulrony to listen for 7CU on 230 meters at any convenient time and I will take particular care to have my station in tip-top shape.

Truly yours,

Mumford Bros. Radio 7CU.
(Continued on page 147)

2QR IS HEARD IN SCOTLAND

THE following communications have recently been received by 2QR and the accompanying photograph shows the radio telephone equipment that carried the human voice to Scotland.

October 30th, 1920.

Editor, Pacific Radio News,
San Francisco, Calif.

Dear Sir:

Herewith a new photograph of Station 2QR, owned by myself and my son Harold. Quite a lot of new equipment has been added since the last photograph was taken.

We have made several distance records on radio phone transmission, copies of the different letters received relative thereto being enclosed herewith.

The letter from Scotland is self-explanatory, and while we are loathe to believe that it is possible, or that it can be true, yet Mr. Benzie states the facts exactly as they were, which makes the thing more puzzling, and in view of the enormous importances of his letter, we have written him for further and more substantial details of this record, and will advise you more fully later.

Please note that to date we have been reported as being received very QSA on our radio phone at Bristol, Conn., Ashland, Ohio, Canton, Ill., and Napanee, Ont.

Hoping that you may find the photograph and our description of interest, we are,

Yours respectfully,

HUGH ROBINSON,
HAROLD ROBINSON.

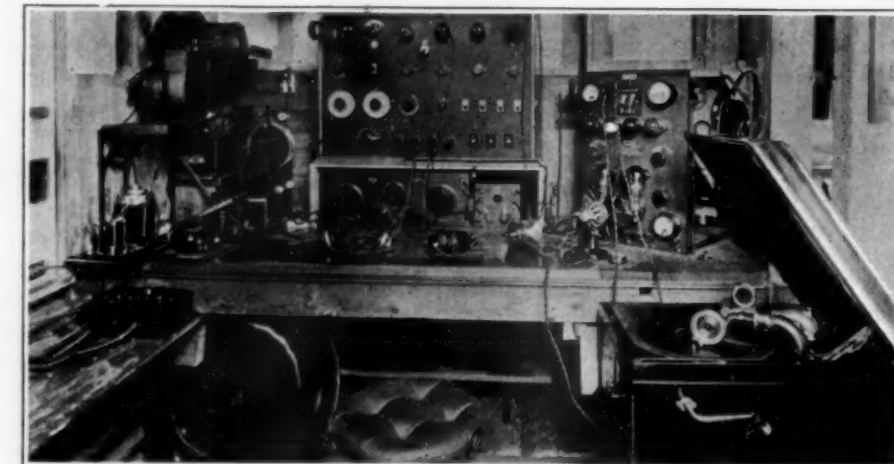
Station 2QR,
13 Walnut Street, Keyport, N. J.

Copy of a letter received from Scotland by 2 QR.

Denmill Cottage
Peterculter,
Aberdeenshire, Scotland.
12th, Oct. 20

Dear Mr. Robinson:

I write to say that my friend and I received your transmission on Oct. 6th to your friend, I could not be sure of this gentleman's name, but we heard the rec-



ord "Roamin' in the Gloamin'" by Harry Lauder and the other tune very clearly; also that your power at the time was 100 watts. I write you this as no doubt you will be interested to learn that you can be heard over here with so small a power. I was using 3 valves. I would be greatly obliged if you could transmit again (radio phone) say three weeks after you mail your letter to me as the letters take some time to reach here. As regards time two hours after the transmission referred to above would suit, hoping you will manage to co-operate in our tests.

Your transmission was received here at about 6 p. m. G. M. T., so if you could transmit two hours later than the time you transmitted on October 6th it would suit me nicely as this would be about 8 p. m. G. M. T. As I do not know how long your time is after ours, this is the only way we could arrange anything definite.

Yours faithfully,

(Signed) GEO. W. G. BENZIE.

P. S. The above letter received by Station 2QR, Mr. H. H. Robinson, No. 13 Walnut Street, Keyport, New Jersey.

Copy of letter received by Station 2QR Mr. H. H. Robinson, No. 13 Walnut Street, Keyport, N. J.

Napanee, Ont.

Oct. 25th, 1920.

Radio Station 2QR
13 Walnut Street,
Keyport, N. J.

Dear Sir:

I am in receipt of your letter of the 20th inst. requesting me to let you know if it was your radiophone or spark set I heard. It was the phone set.

You came in QSA, but the voice was indistinct. I am using one British V-24 triode valve and tickler circuit with DeForest coils.

Hoping that this information is satisfactory, I remain, with 73's,

Yours sincerely,

(Signed) W. A. EATON.

186 Exeter Terrace,
Buffalo, N. Y., Oct. 26th, 1920.

RADIO 3FE.

Napanee, Ont.

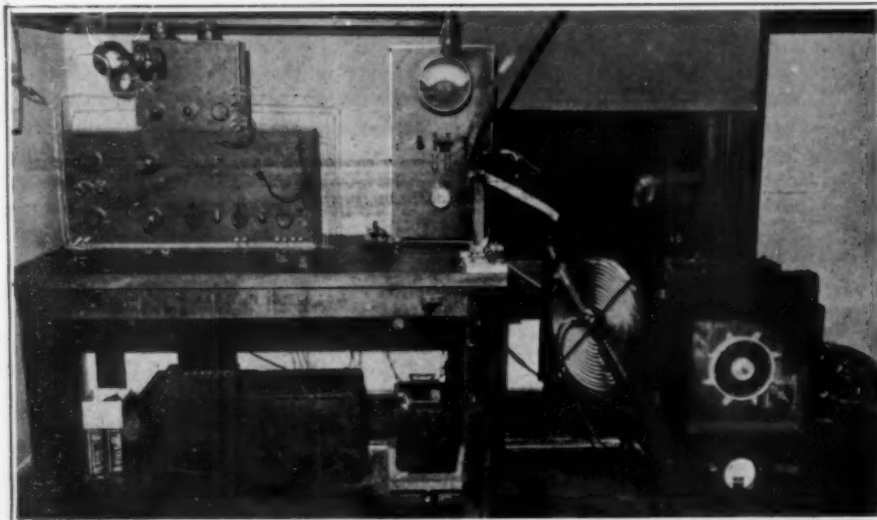
Dear Friend 2QR:

I heard your radio phone Sunday night and am anxious to know what you were using. I have a short wave regenerative set and three step amplifier, but was just using the regenerative alone when I heard you. Static is bad here, so can't use the amplifier much. I heard that you were using a De Forest phone set, but your voice was very clear and distinct, and I missed the usual hum that the local ones give.

Would appreciate a description of your set.

Well cul. om. "73's."

(Signed) GEORGE B. SEARS (8LB).



THE station shown in the accompanying half-tone is that of Mr. Louis Falconi of Roswell, New Mexico. Many of our Pacific Coast amateurs will be interested in the equipment on account of the reliability of communication that it has established. 5ZA has combined efficiency with SYSTEM in the installation of his apparatus. His instrument table is devoid of any unnecessary equipment. Signals from this station have been reported heard at Fort Pierce,

Florida; Princeton College, N. J.; Pittsburgh, Pennsylvania; Valley City, North Dakota; Portland, Oregon; Los Angeles, California, and many other distant points. Satisfactory communication has been established with amateur stations at a distance of more than 1000 miles.

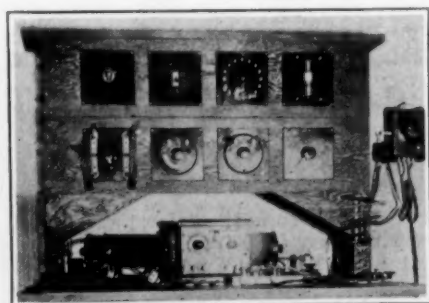
The transmitter consists of both rotary and quenched gaps, Thordarson 1 K. W. transformer, pancake oscillation transformer, oil immersed condenser constructed of copper sheets and glass plates, and a radiation meter. The transmitter is mounted on an angle-iron frame and assembled into one complete unit, thereby avoiding the use of unnecessary leads in the oscillating circuit. The rotary gap is of the belt-driven type with the motor mounted on back of the panel.

The switchboard on the table controls the power circuit. A large ammeter indicates the power input. Under the table may be seen the "A" and "B" batteries as well as a vibrating rectifier for charging the filament battery.

The receiving equipment consists of a long wave receiver using honeycomb coils. A short wave receiver is also used for amateur work and is of the variometer regenerative type. The upper small cabinet houses the long wave units, while the lower cabinet houses the short wave apparatus and a two-stage amplifier. The amplifier is connected in such a manner that it may be used with either receiver. Plugs and jacks are used for varying the amplification steps and for the telephone connections.

The aerial is constructed of four wires, eighty feet in length and of an average height of sixty feet.

NEATNESS and efficiency prevails at 6WM, a photograph of whose station we show herewith. The transmit-



ting equipment, not shown in the photo, consists of a ½ K. W. Thordarson transformer, 12 tooth rotary gap, 3 sections of Murdock condenser units, pancake type oscillation transformer and 5 K. W. transmitting key. The aerial is of the four wire type, 100 feet in length. Stranded tinned copper wire is used and a cable of 19 strands of No. 8 solid copper is used for a ground lead. The receiving set shows up clearly

in the photo. A two step amplifier and several variometers have been added to the receiving equipment since the photo was taken.

Statement of Ownership, Management, Circulation, Etc., Required by the Act of Congress of August 24, 1912

Of Pacific Radio News, published monthly at San Francisco, California, for October 1, 1920.

State of California, County of San Francisco—ss.

Before me, a notary public, in and for the state and county aforesaid, personally appeared H. W. Dickow, who, having been duly sworn according to law, deposes and says that he is the owner of the "Pacific Radio News," and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Pacific Radio Publishing Company, 50 Main street, San Francisco.
Editor, Paul R. Fenner, 50 Main street, San Francisco.

Managing editor, none.

Business manager, H. W. Dickow, 50 Main street, San Francisco.

2. That the owners are: (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.) H. W. Dickow, 50 Main street, San Francisco.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state) Paul R. Fenner.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the

company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is—. (This information is required from daily publications only.)

H. W. DICKOW,

Owner.

Sworn to and subscribed before me this 23rd day of September, 1920.

(Seal) MARGUERITE S. BRUNER,
Notary Public in and for the City
and County of San Francisco,
State of California.

My commission expires January 8th, 1922.

STATIONS WORKED BY 6OC

6FS, 6AK, 6EJ, 7CU, 7BP, 7DA, 7IN, 6FE, and 6OH.

The following stations report hearing 6OC with good audibility: 6SK, 6JD, 6EA, 6AJ, 6DP. A home-made ¼ KW transformer, Benwood gap and oil condenser are the essential parts of the transmitter used by 6OC. With this equipment he succeeds in getting four amperes into the air.

CALLS HEARD BY 6JD

Heard: 5ZA, 9LR, 6AH, 6AS, 6CV. Worked: 7CU, 7ZI, 7DA, 6OH, 6DP, 6AV, 6OR, 6BQ, 6GE, 6PJ, 6II, 6BN, 6JN, 6EX, 6AN, 6ZE, 6JR, 6BJ, 6CO, 6AT, 6QM, 6UM, 6EJ, 6AK, 6EP, 6JI, 6ZB, 6MZ, 6AE, and 6AM. Stations 6JI, 6ZM and 6MZ can be worked any time, day or night.

CALLS HEARD BY 6EA (Additional)

Stations heard are: 5ZA, 6ABX, 6AH, 6AM, 6NE, 6PJ, "RI", "SF", (QRA?) Stations worked are: 6AE, 6AK, 6DP, 6EJ, 6FE, 6JF, 6JN, 6JR, 6OH, 6QM, 6QR, 7ZI. Anyone hearing 6EA please write. All letters answered.

6BB, the 500 cycle spark station at the University of California Radio Club, is penetrating the ether as far north as Vancouver and as far south as Los Angeles. The power input is ½ K. W. and stations in Reno, Nevada, have been worked of late. Propaganda relating to the 12th amendment on the California ballot has been broadcasted every Tuesday evening.

ERRATA

Through a mistake in re-copying the original wiring diagram of the article entitled "A Short Wave Regenerative Receiver of High Efficiency and Unique

Control" in our November number, the connection between the grid condenser and grid proper was omitted. Unless this circuit is completed the receiver will not function properly.



CHELSEA VARIABLE CONDENSERS (Die Cast Type)

No. 1.—.0011 m.f. mounted	\$5.00
No. 2.—.0006 m.f. mounted	4.50
No. 3.—.0011 m.f. unmounted	4.50
No. 4.—.0006 m.f. unmounted	4.00

Top, bottom and knob are genuine bakelite, shaft of steel running in bronze bearings, adjustable tension on movable plates, large scale reading to hundredths, high capacity, amply separated and accurately spaced plates.

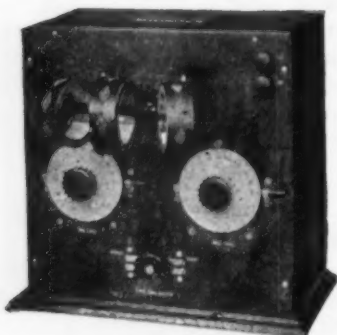
Unmounted types will fit any panel and are equipped with counter-weight.

Purchase from your dealer; if he does not carry it, send to us. Bulletin sent upon request.

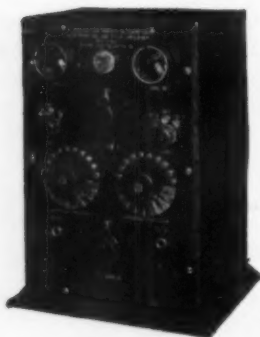
CHELSEA RADIO CO. 13 Fifth St., Chelsea Mass.
Manufacturers of Radio Apparatus and Moulders of Bakelite



Christmas Suggestions for the Radio Amateur



Type T-200
Multi-Wave Tuner
Wave Length, 150; 25,000 Meters



Type P-300
Combination Audion-Ultra
Audion and One-
step Amplifier

PUT De Forest Radio Apparatus on your Christmas list. Here are two instruments that will greatly increase the efficiency of your set.

Type T-200 Multi-Wave Tuner

Responds to any wave length, 150 to 25,000 meters. Contains triple adjustable coil mountings; Vernier primary and secondary tuning condensers; primary condenser switch; all mounted on engraved Bakelite panel and in handsome cabinet; size, 13x18x12 3/4. Price (without coils).....\$85.00

Type P-300 Combination Audion-Ultra Audion and One-Step Amplifier

Specially designed to fill a real need for an instrument of this kind in the average amateur station. When used in connection with the T-200 Tuner shown above, it completes a receiver of unequalled efficiency. Cabinet size, 12 1/2 x 8 3/4 x 7 3/4. Price (without tubes).....\$75.00

Send 10 cents in stamps and get the De Forest Catalogue "D" giving complete descriptions of these cabinets, as well as many other quality instruments.

DeForest Radio Tel. & Tel. Co.

Inventors and Manufacturers of High
Grade Radio Apparatus

1415 Sedgwick Ave., N. Y. City

LEE DE FOREST, INC.

Western Distributors

451 Third St. San Francisco



AERIAL MAIL SERVICE IS IN- AUGURATED TOO EARLY; RADIO SYSTEM UN- COMPLETED.

THAT the aerial mail service from San Francisco to New York was established by order of Second Assistant Postmaster-General Prager at least two weeks too soon became obvious recently when it was learned that a mail plane had dropped from sight and was supposed to be lost somewhere in the Nevada desert.

The radio system by which the San Francisco field will be able to keep in communication with the planes and the landing fields clear across the continent has yet to be completed. Nor have the ships now carrying mail "over the hump" and across the plains been equipped with wireless. As a result a pilot leaving here is out of communication with the flying field and is liable to lose his bearings.

Had Montgomery Field been fully equipped and ready for the task imposed upon it by the Second Assistant Postmaster-General, Pilot John L. Eaton would not have been lost in the Nevada desert, the critics of the air mail service point out. The radio at that field would have picked up trace of him almost at once, it is declared.

Had the plane been fully equipped with wireless telegraph and direction finder, to be installed on all airplanes, that will notify the pilot the instant he swerves from his course, Pilot Eaton would not have been the object of a state-wide search.—S. F. "Bulletin."

The five bulb radio telephone set of the Radio Telephone shop that was heard in Vancouver, Washington, will be on exhibition at the Radio Show of the Pacific Coast Convention. Mr. A. F. Pendleton, manager of the Radio Telephone shop, will give daily demonstrations of the equipment.

6 BN'S SPARK SET FOR SALE

- 1 Rotary control rheostat ..\$ 2.00
- 1 Primary input regulator .. 2.50
- 1 8-pt. 3450 RPM rotary.... 25.00
- 1 Motor with 6-pt. disc 4000 RPM 12.50
- 1 Thordarson Oil Plate Condenser 25.00
- 1 Murdock Oscillation Transformer 4.00
- 1 0-5 Hot Wire Ammeter.... 3.00
- 1 3-4 K.W. Thordarson (new type) 35.00
- 1 C.W. 500-v. Transformer.. 5.00
- Numerous Binding Posts, Contacts and Knobs

Holliway & Shaw-6BN

1175 Washington St., S. F., Cal.

Trans-Pacific Radio Operators Log

By W. Breniman
and G. E. Knudsen

A 32-Page Pamphlet containing reliable data on Pacific Coast Radio stations, call letters, weather reports, time signals, wave length data, press schedules, etc.

EVERY COMMERCIAL OPERATOR SHOULD HAVE A COPY

Ready For Distribution on
November First
Price 50 cents

W. BRENIMAN

Room 420 24 California St.
San Francisco, Calif.

LEARN WIRELESS At Home By Mail



Big Concerns In Need of Operators

Calls Coming In Steadily For National Radio Institute Graduates

Many attractive positions are now open in Commercial Land Radio Service, Merchant Marine, Radio Supply Factories, Lake and Ocean Steamship Lines, Telegraph Companies and U. S. Shipping Board.

Salaries up to \$3500 a Year

Exceptional opportunity for ambitious men for promotion to the higher branches of Radio. You can learn Wireless the National Radio Institute way, quickly and easily by mail, right in your own home in your spare time. No previous experience or training necessary. With our help you can quickly qualify for a First Grade Government License, and a good position.

Our graduates qualify as Senior Operators and start with a salary of \$125 a month besides Room and Board, which means more than \$200 a month. One of our recent graduates is getting \$6000 a year.

U. S. Department of Commerce recognizes N. R. I. graduates and allows them a credit of 5 points when taking examinations.

Travel Without Expense

If you are eager to travel—eager to visit foreign countries—Wireless offers you the chance of a lifetime. On shipboard you are rated as an officer, living and eating with the officers. However you are not obliged to travel if you secure a position at one of the land radio offices which are steadily increasing in number.

Instruments Furnished Free

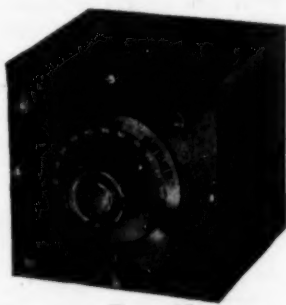
In addition to all books and equipment with which we supply you, we furnish FREE to every student, a Natrometer, which consists of an automatic transmitter and receiver. You receive the instrument after your enrollment; it becomes your personal property upon completion of our course.

The Natrometer automatically sends you messages in International Code, just as though they were coming to you from a station a thousand miles away! The instrument is operated entirely without the use of aerials.

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Write today for FREE catalogue of interesting and valuable information.

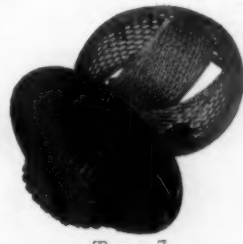
National Radio Institute
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Type 12

HERE IT IS

Lattice Wound Variometers Especially Designed



Type 7

TO IMPROVE THE SHORT WAVE REGENERATIVE CIRCUIT

Realizing the need of a neat, compact and highly efficient variometer for the modern receiving set, we have produced one which we feel will meet the requirements.

Type 7 is assembled ready for panel mounting and can be easily mounted by simply drilling a 1/4-inch hole in the panel.

Type 12 is a complete unit and consists of Type 7 mounted on a 4 1/2 x 4 1/2 bakelite panel incased in a mahogany finished cabinet. Four binding posts are provided so that leads can be connected to any side.

Both types are furnished with a standard 3-inch dial and knob and make a very attractive instrument.

PRICES (Charges Prepaid)

Type 7G (for grid circuits)	\$ 7.50
Type 7P (for plate circuits)	7.50
Type 12G (for grid circuits)	12.50
Type 12P (for plate circuits)	12.50

ATTRACTIVE PROPOSITION TO DEALERS

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Sole Agent and Distributor

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Connecticut, Table Mounting, Maximum Capacity .0013.....	\$5.00
Chelsea No. 1, Table Mounting, Maximum Capacity .0012.....	5.25
Chelsea No. 2, Table Mounting, Maximum Capacity .00068.....	4.75
Chelsea No. 3, Panel Mounting, Counter Balanced, Cap. .001..	5.00
Chelsea No. 4, Panel Mounting, Counter Balanced, Cap. .0006	4.25
Amco Fixed Telephone Condenser .....	.75
Grebe Grid Condenser and leak	1.20
Chelsea Variable Grid Condenser	3.00

SOCKETS

Remler, Back or Table Mounting	\$1.50
Ace, with grid leak.....	1.50
Ace, Casting only.....	.55
De Forest, Back Mounting.....	1.60
General Radio	1.75
Murdock	1.00

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Remler Junior, Back Mounting	\$1.00
Remler No. 81.....	1.75
Paragon	1.75
Parkin, Front Mounting.....	1.00

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Murdock, 3000	5.75
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Murdock, No. 324.....	\$.75
Adams Morgan	1.75
Jove	2.00
Grebe, dust proof.....	2.80
De Forest	3.00

GREBE

Vacuum Tube Unit.....	\$17.00
Single Stage Amplifier.....	25.00
Two Stage Amplifier.....	50.00
Detector and Two Stage Amplifier	75.00
Variable Inductance	16.50
Variable Coupler	16.50
Air Condenser	17.50

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No. 18, Single Cotton, lb.....	\$1.20
No. 20, Single Cotton, lb.....	1.45
No. 23, Single Cotton, lb.....	1.90
No. 26, Single Cotton, lb.....	1.90
Enamel	2.80
No. 28, Single Cotton, lb.....	3.00
No. 31, Single Cotton, lb.....	4.70
No. 34, Single Cotton, lb.....	4.80

ARC RADIO APPARATUS

(Continued from page 127)

ing the arc temporarily useless. It is recommended, in cases where the convertor is designed to use coal gas, kerosene, gasoline, acetylene or other gas having a heavy solid product of combustion, that the arc be so designed as to provide additional insulation within the chamber.

The choke coils, of which there should be one in each leg of the supply circuit, are for the purpose of smoothing out ripples in the input current and for the purpose of preventing high-frequency surges from entering the supply circuit where they might cause damage to windings such as are found in meters and other light electrical machinery. These inductances should have a value of at least one henry, which, unless a great amount of wire is used, will require the use of an iron core. A quality too often overlooked in the design of choke coils for high-frequency circuits, is the minimizing of winding capacity. This is very essential, for, in order to prevent high-frequency surges from entering the supply circuit, the distributed winding capacity must be negligible. Their inductance need only be a fraction of that which is required in the supply circuit for stabilizing the supply current and for producing a high potential when the arc is extinguished during each cycle. The field coils are generally depended upon to furnish this additional inductance.

The frequency of oscillation of an oscillating circuit containing an arc is not, strictly speaking, a function of the capacity and inductance in that circuit. For example, the fundamental equation,

$$f = \frac{1}{2\pi \sqrt{LC}}$$

does not necessarily hold and as a matter of fact, can seldom be used with accuracy. This results from the fact that the arc resistance is continually changing with the wandering of the arc around the electrodes, and because the oscillations directly produced by small arcs are generally non-sinusoidal. Invariably, oscillograms show this to be the case with small arcs. If beat reception is used, this fact will evidence itself by the continual changing in the frequency of the audible signal.

Insofar as the design of oscillating circuits for use with arcs is concerned, this deviation presents no especially difficult problems, as the variations are not so great that small adjustments of inductance or capacity will not compensate for them.

Mica condensers are recommended for the closed circuit if one is used, but these should be specially designed to withstand the high potentials frequently found. Certain Navy Standard jars are very good, also. These have a capacity

Grid
Condensers



Prepaid
50 cents each

Hermetically sealed. 100 per cent efficient. Not subject to changes of atmosphere. Efficient performance guaranteed. A recent patent permits the construction of very small capacitances in very small compartments.

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Dept F.

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NEW ORLEANS, LA.

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of 0.002 microfarad each and a bank of four jars (series-parallel arrangement) having a total capacity of 0.002 microfarad will be found admirably well adapted for use with arcs up to 5 K. W. capacity.

For the smaller arcs, one jar, filled with oil to prevent sparking, and for cooling purposes, will suffice.

Inductances should be wound with stranded wire to minimize high-frequency resistance. The best installations use a special "Litz" composed of hundreds of strands of enameled copper wire braided over with one covering. For small experimental installations, the commercial stranded lamp cord (one conductor) may be used, and this may be wound upon any non-metallic form. No separation between turns other than that provided by the insulation will be necessary. For arcs larger than the 2 K. W. size, larger conductor and additional separation between turns will be necessary.

A very satisfactory inductance unit may be constructed by making a spool of two large phonograph records and a small circular disc of wood at the center. The wood disc should have a thickness equal to the diameter of the wire over the insulation, and this will make possible the winding of a spiral inductance with any flexible wire. Several of these units may be mounted upon a horizontal rod for convenience in adjusting the value of mutual or self inductance. Formulae and data for the design of inductances and capacities may be found in many publications already on the market, hence their appearance here would be highly superfluous. Bulletin No. 74 of the Bureau of Standards is recommended for any information in this direction that may be necessary.

(To be Continued)

A NEW antenna has been erected on the roof of the Humboldt Bank Building, San Francisco, for the radio-telephone station in the California Theater of Lee De Forest, Inc. This change, together with several other improvements made by the company's engineers, has already resulted in increased strength of telephonic and telegraphic signals. According to present plans this station will furnish the music for the radio ball to be held at the Radio Convention.


It may be of interest to our readers to know that on Sunday, September 12, from 11:23 a. m. up to when the NPG arc sent the noon time signals, POZ was heard by 6EA. His audibility was readable on a single Audiotron, using the ultra-audion hook-up with a home-made "Eaton" oscillator connected on a 200 meter transmitting antenna (45 feet long).

New Catalog
of
**Radio
Apparatus**

RADIO APPARATUS
Our apparatus
must please you—
all your money
returned if it
does not.

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on Request**

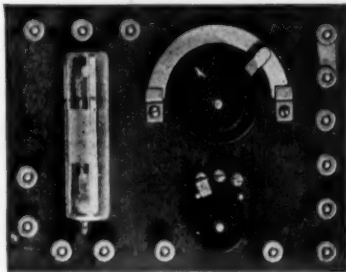
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**Navy Type Key
Marble Base
Silver Contacts** **\$5.85**
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"Signal" Radio Apparatus



**"Signal" Vacuum Tube
Control Panel**
No. R38.....\$12.50

Our Vacuum Tube Control Panel is without doubt the most adaptable, compact and efficient instrument of its type on the market. Unlike most panels, the circuits are not fixed. Instead, the terminals are so brought out that the experimenter can use any vacuum valve circuit without needless crossing of wire or doubling connections to any binding posts. Controlling the current values of the vacuum valve is remarkably easy, due to our combination switch, only one hand being necessary to operate both potentiometer and filament rheostat. Another fine feature is the small switch for cutting in either filament or cutting out both, which lessens the danger of breaking the filament leads and makes either filament accessible. Price does not include tube.

"Signal" Panel Mounting Variable Condensers

No. R76-43 Plate .0008 M.F. \$5.10
No. R77-21 Plate .0004 M.F. 4.50
No. R78-11 Plate .0002 M.F. 3.90

The constant demand for a condenser for panel mounting has caused us to manufacture these three models. We have so constructed them as to permit mounting on any panel from $\frac{1}{8}$ to $\frac{3}{8}$ inch in thickness. Each instrument is furnished with a metal scale calibrated to 180 degrees. The knob and pointer are removable by means of a single flat head machine screw. The plates in our condensers instead of being the usual .015 in thickness, are die stamped from hand rolled aluminum sheet .026 thick. The bearing plates are 3/16 inch black formica. Two connection strips are furnished. We also manufacture the 43 and 21 plate for individual use, with glass case, at a slight increase in price.

We manufacture a complete line of amateur wireless instruments and if your dealer cannot supply you write our nearest distributor for our complete catalogue, mentioning your dealer's name.

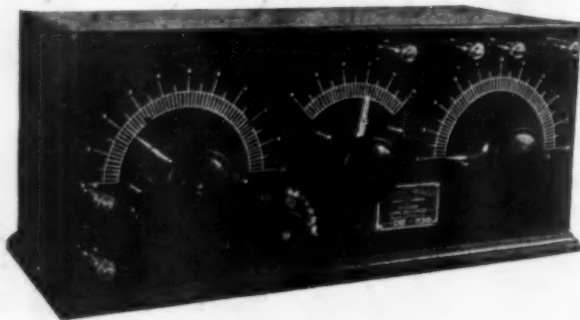
SIGNAL ELECTRIC MFG. CO. MENOMINEE, MICH.

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Globe Commercial Co., 618 Mission St., San Francisco, Cal.	R. E. T. Pringle Co., 95 King St., East, Toronto, Ont.
G. C. Kowfeldt & Co., 2541 Chicago Ave., Minneapolis, Minn.	C. H. Wallis & Co., Syndicate Trust Bldg., St. Louis, Mo.
Signal Electric Mfg. Co., 33 S. Clinton St., Chicago, Ill.	Newman Stern Co., 1874 6th St., Cleveland, Ohio.
Brian & Powers, Canal Bank Bldg., New Orleans, La.	P. M. Dreyfuss Co., 150 Chambers St., New York, N. Y.
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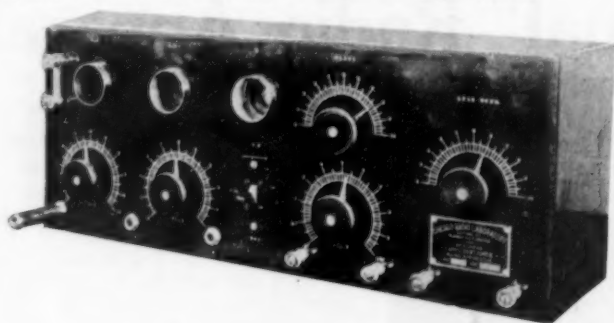


**It won't perch on the tree, but---
IT MAKES A "BIRD" OF AN XMAS GIFT**



C. R. L. Paragon Reg. Receiver

The C. R. L. Paragon, with its tremendous amplification factor and extreme electrical efficiency combined with mechanical perfection and convenience, makes the ideal Christmas present—and you can be sure that it will be appreciated—BUT be sure that you get the genuine C. R. L. product. Look for our name on the instrument. The genuine C. R. L. Paragon is used in almost all long distance stations throughout the country. Price, F. O. B. Chicago, \$65.00.



C. R. L. Amplifigon, Type AGN-2

**IF A "BIRD" OF A GIFT ISN'T ENOUGH FOR HIM, ADD AN
AMPLIFIGON AND MAKE IT A "WHALE"!**

The C. R. L. Amplifigon detector and two step amplifier is now equipped with phone plug and jacks for detector and each step, our special 3-way battery switch with transmitting position, extra phone posts, NON-SQUEALING transformers and many other special features. Combined with the C. R. L. Paragon, it makes up the BEST complete short wave receiver on the market today, bar NONE. Price, F. O. B. Chicago, \$105.00.

Both sets fully guaranteed for TWO YEARS.
Licensed under Armstrong and De Forest patents.
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The standard insulating material for all radio work. Water-proof, permanent, strong, used by all important manufacturers of wireless apparatus and others requiring the utmost in insulation.

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THE STANDARDIZATION OF APPARATUS DESIGN

(Continued from page 123)

agree on details, but if the fundamentals of the experimenters' wants are boiled down, certain conclusions can be drawn.

The first fact precipitated is that nine hundred and fifty of every thousand are not highly technical radio men. That is, they can't give an intelligent explanation of the amplification factor of a tube, or the measurement of decrement. If someone talks of matching tube impedances, they are speechless. In fact, not more than fifty out of a thousand can work out the inductances and capacities for a receiver to operate over a given range of wave lengths.

Experimenters do not spend a great deal of money. For every station worth a thousand dollars there are five hundred which represent no more than fifty dollars in cash expended.

But here is the paradox. Every one of them wants his apparatus to look like real, commercial stuff. It must have the atmosphere of scientific instruments. Here is the manufacturer's problem—to produce this effect of refined, yet sturdy design, and to do it at a low price. And it is no small problem.

One of the first and most important steps toward this achievement is to so design or complete sets as to produce an effect of symmetry. As the old houses with their knick-knack furnishings have passed out, so the conglomerate, helter-skelter radio station, has seen its last days. Even the casual visitor, on whom the experimenter secretly enjoys making an impression, is not convinced if the apparatus looks like a collection of assorted instruments.

Moreover, the experimenter finds himself handicapped if the equipment and its arrangement is not sufficiently versatile to permit the trying of new circuits, the introduction or substitution of different instruments, or the temporary removal of one part of a set-up.

Therefore, the optimum system of designing complete sets and supplementary or individual instruments must give, separately and collectively, that desired appearance; it must be adaptable to experimental work or permanent installations, and must meet the final, and largely controlling factor of low price.

The G. A. Standardized Construction

Mr. Sleeper's answer to these conflicting requirements was the "five by five" system. That is, all the panels in the examples of design which he submitted were of dimensions in multiples of five. The smallest panel, only used in special cases, was 2.5 by five inches. The majority of the separate instruments were carried on 5x5-inch panels, while others had panels 5x10 inches, 10x10 inches, and 10x15 inches.

But it was not enough to decide on the panel sizes. Individual instruments must not only function with others of various makes,

(Continued on page 144)

Rotary Gap

WITH 110 VOLT A. C. OR
D. C. MOTOR

\$12.00

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Radio Development Co.

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Portland Radio Exchange

RADIO APPARATUS BUILT
TO YOUR SPECIFICATIONS

We also have a stock of reliable
Radio equipment on hand including
the apparatus manufactured by the
Radio Development Co., and Pacific
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LET US KNOW YOUR WANTS

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Get that Boy a Wireless Set for Christmas

Nothing could be more interesting or instructive. It trains the mind and furnishes scientific, never-failing amusement to young and old. If you do not know just what kind of a set to buy, send an "S O S" (call for help) to

Our Radio Dept.

We not only carry a full stock of Wireless supplies and sets, but we also are prepared to give valuable advice and counsel as to the best set to buy.

Complete set that will re-
ceive 200-mile messages
for as low as

\$16.00

De Forest Honeycomb Coils, General
Radio Vacuum Sockets, Moorhead
Vacuum Tubes, Audiotron Globes,
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JUST OFF THE PRESS SOMETHING NEW

Simple description of the Radio Telephone with complete circuits of a Trans-
mitter, Receiver and Amplifier. With this data any one can construct a Radio
Telephone capable of talking fifty miles. The Amplifier used with a loud speaker
intensifies the voice very clearly. 50 cents postpaid.

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Buy Your Radio Apparatus on the Pacific Coast

De Forest, Amrad, Radisco, Bunnell, Mur-
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in stock at list prices F.O.B. Seattle.

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Arco Amplifying Transformers.....	\$5.00
Federal Transformers	7.50
Mica Grid Condensers.....	.50
Genuine Navy Rheostats.....	2.75
45-volt "B" Batteries.....	5.00
Audion Panels	11.00
Audion Panels (professional).....	15.00
1-stage Amplifier	22.50
2-stage Amplifier.....	40.00

We reached Portland (150 miles) with our
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install one?

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Made from Anhydrous Redmanol Resins

Formica is a homogeneous waterproof in-
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erties. It is readily machined and does not
warp or shrink.

Formica is the ideal material for panels and
other insulation parts of Radio Apparatus, on
account of its superior electrical and mechanical
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THE FORMICA INSULATION CO.

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SPECIAL THIS MONTH— { Knob and Lever, 10 points, with nut
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HI-GRADE WIRELESS INSTR. CO. ASHEVILLE, N. C.

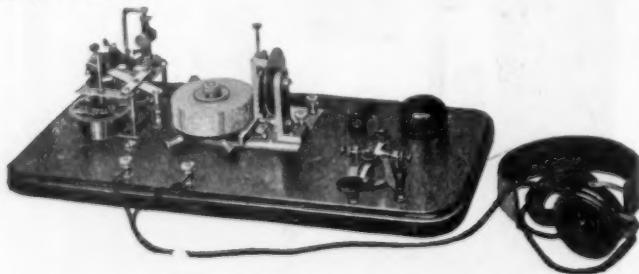
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The Demand for Good Wireless Operators Far Exceeds the Supply

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CONVENTION BRIEFS

APPLICATIONS for seat reservations at the Convention have been received from points as far distant as North Dakota, Reno, Nev., Los Angeles, Calif., Chicago, Ills., Santa Barbara, Calif., and from other remote cities.

MAYOR ROLPH of San Francisco will open the Pacific Coast Radio Convention with an address over the telephone from his residence, from where it will be carried to the California Theatre and sent "into the air" by the De Forest Radiophone. By means of an amplifier and Magnavox, the address will finally reach the Convention Hall.

THE Hotel Whitcomb has been selected as the official hotel headquarters for the visiting delegates and others who contemplate attending the Radio Convention. Busses will meet all incoming trains and steamers. The special rate quoted for visitors is \$2.50 per day for a single room without bath and \$3.00 per day and up for a single room with bath. Visitors may, of course, select any hotel but it is the desire of the Committee on Arrangements to house the entire delegation in the same hotel in order to further the acquaintances of all concerned.

OUT-OF-TOWN radio men who desire to attend the radio banquet and radio ball are kindly requested to make their reservations at an early date. The radio banquet will be a novel affair. The price has been set at \$1.75 per plate.

THE arrangement committee has undertaken the task of giving the "long distance delegates" a royal time on Thanksgiving Day. A number of members of the San Francisco Radio Club have agreed to invite the visiting delegates to their homes for dinner when the main convention is brought to a close. There will be no convention activities on the night of November 26th.

Radio Apparatus of Quality

Antenna Wire	
No. 14 85 ft. per lb., hard drawn copper.....	60c lb.
No. 12 50 ft. per lb., hard drawn copper.....	60c lb.
No. 14 85 ft. per lb., soft copper.....	80c lb.
Storage Batteries	
Everready Storage for Audion Filament—6v.—40 amp. hr.....	\$19.50
Everready Storage for Audion Filament—6v.—60 amp. hr.....	\$21.00
"B" Batteries	
"B" Battery—Standard Variable Voltage—45v. 6 tap.....	\$5.00
"B" Battery—Standard Variable Voltage—Navy Type.....	\$3.00
Telephone Receivers	
Brandes Superior Receiver	\$8.00
Brandes Trans-Atlantic	15.00
Brandes Navy Type	17.00
Murdock No. 55 Receiver, 2,000 Ohms	5.25
Murdock No. 55 Receiver, 3,000 Ohms	6.55
Vacuum Tubes	
Moorhead Electron Relay.....	\$6.00
Moorhead Amplifier	7.00
Moorhead Transmitting	7.50
Audiotron Tube	6.00
Vacuum Tube Sockets	
Murdock	\$1.00
Mica Grid Condensers	
Signal Electric	75c
Variable Condensers	
Parkin .001 mf. unit alone, may be mounted on any shaft.....	\$1.50
Parkin .001 mf. unit with knob, shaft and pointer.....	2.00
Parkin .001 mf. unit—complete with 3 in. black dial.....	2.50
Perfection knocked down—21 plate.....	2.25

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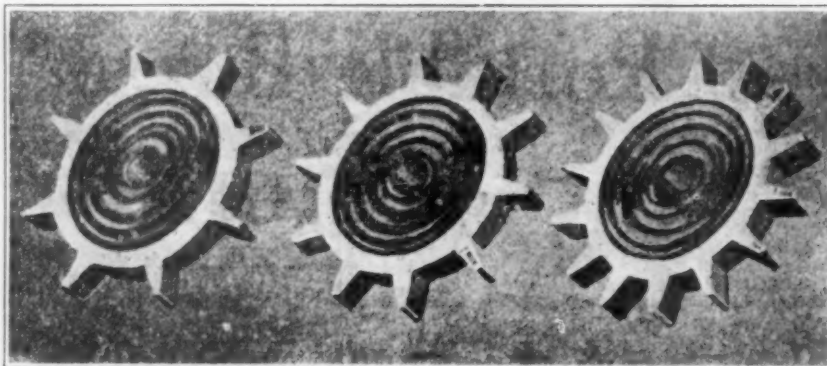
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Here is a real disc



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Made with 4, 8, 10 and 14 points. Drilled for any size motor shaft. Has WIDE sparking points that are tapered, thus giving the quick break that is so much desired by those who know.

THE PRICE OF THIS DISC IS \$8.00

Designed for 1 K. W. installations

Order from your dealer. He has them in stock. If not we can ship direct and make IMMEDIATE shipment.

Specify size of motor shaft when ordering.

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Materials and Parts

FOR THAT NEW SET YOU ARE BUILDING, WE HAVE IT

Brass sheet, round and square rods, sheet aluminum, fibre, bakelite and hard rubber cut to size, machine and wood screws, binding posts, switch points, knobs, insulators, switches of all types, variable and fixed condensers, and cardboard tubing.

Murdock, Acme, Tresco, Bunnell, Moorhead, Parkin and Burgess products in stock and we can give you the service you want. Our new catalogue sent for 5 cents, which will be refunded on first order for one dollar or over. Try us on your next order.

KEYSTONE RADIO CO.

DRAWER 307

GREENVILLE, PA.

When writing to Advertisers please mention this Magazine

(Continued from page 140)

but the line of any one company must be so planned that the separate parts can be combined into complete circuits. Also, this subdivision cannot be carried out too far. Complete tube units were developed ranging from a single audion detector to a detector and two-stage amplifier. Many radio men maintained that a detector and two-stage amplifier, with three jacks, could not be put on a 5x5-inch panel, but it was done beautifully and easily. Separate condensers and inductances were worked out covering all the various requirements of tube and crystal circuits.

These instruments can be put together to form any known circuit, yet the panels, when grouped always give the finished appearance of a single panel without its disadvantages. A complete set can be added without making it unsightly.

However, this was not the whole story. With the instruments designed for standardized panels, some method of mounting them was needed. Again, Mr. Sleeper was called on, and with the writer, worked out the G. A. instrument case, now being made the subject of a design patent. It was found that, with all binding posts on the front, the advantage of the system was destroyed by the net work of wires draped over the panels.

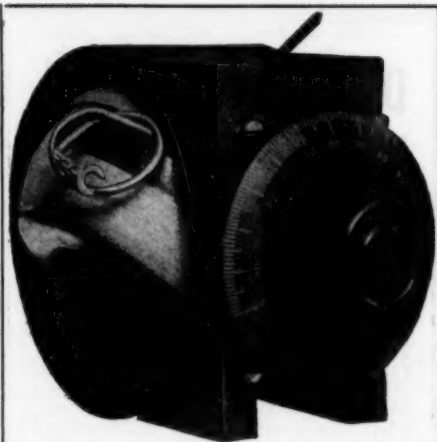
Accordingly, a small connection panel was mounted, by square brass rods, to the rear of the main panel. Then, at the back of the box, an opening was made so that when the main panel was put on the front of the box the connection panel fitted into the opening at the rear. The top of the box was hinged to permit inspection or the changing of tubes. By doing this, all the advantages of panel mounting were retained, and the binding posts relegated to the rear where the wires could run around as much as they chose without spoiling the front.

If the panels are not fitted in boxes they can be held together by brass strips, a very satisfactory and convenient arrangement. Boxes can be purchased later if desired.

The General Use of "Five by Five" Construction

It would not be right to take up so much of the valuable space in "Pacific Radio News" to do nothing more than tell why and how the G. A. Company adopted the "five by five" system of apparatus design. The object of this article is to show other manufacturers the advantage of the method. We all know that the average experimental station is made up of instruments from a number of companies. It is certainly desirable to have the different instruments from one company supplement each other mechanically as well as electrically. And how much it will help the experimenter to raise his own standards if he can fit together in a complete set the apparatus of different companies.

The writer believes that the Western manufacturers will not fail to see the advantages of the "five by five" system as such Eastern companies as Amrad and others have seen.

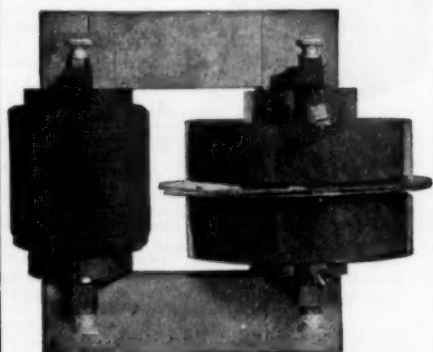


TYPE Z. R. V.

Variometer has unit construction with bakelite shell and hardwood ball. Has low dielectric losses and a range of inductance of 1.25 mil henry maximum to .1 mil henry minimum. Is readily used on table or mounted on panels.

Complete with 3-inch dial and knob \$6.50

Without dial or knob.....\$5.75



TYPE Z. R. L.

Transformer for use with rotary spark gap has two section secondary, bakelite terminal supports and high grade construction, 400 watts power rating highly efficient at 200 meters.

Price \$14.00

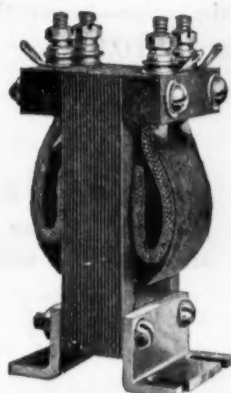
Apparatus which excels in those qualities which for 13 years of continuous manufacture have maintained its enviable reputation for reliability will be found pre-eminent in the display rooms of discriminating dealers and is manufactured by

CLAPP-EASTHAM COMPANY
140 Main St., Cambridge, Mass.

Catalogs mailed for 6c stamps.

To obtain the very best results use

Federal Standard Accessories



No. 226-W—Type A
Audio Frequency
Transformer

THEY ARE USED by the leading Experimenters, Manufacturers and by the Government.

The standard 226-W Audio Frequency TRANSFORMER is more popular and efficient than any other because it GIVES RESULTS. YOU SHOULD USE IT.

Our new Bulletin 102 W-B is now ready for mailing. Send 4c in stamps.

CONTAINS NEW INFORMATION

Our line of Jacks and Federal Duo-Lateral Inductances just out.

If your dealer does not have them, write the

Federal Telephone and Telegraph Company

1766 Elmwood Ave., Buffalo, N. Y.

PACIFIC RADIOSCHOOL ARC AND SPARK SYSTEMS

THE MOST UP-TO-DATE AND EXCLUSIVE RADIO SCHOOL IN THE WEST. LATEST TYPE POULSEN 2 KW ARC TRANSMITTER AND INDEPENDENT TYPE ONE KW 500 CYCLE SPARK SET. EQUIPMENT IN ACTUAL OPERATION.

NAVY STANDARD RECEIVING SET WITH AUDION AMPLIFIER. UNDER THE PERSONAL SUPERVISION OF ADDISON S. MCKENZIE, CHIEF ELECTRICIAN, U. S. N. R. F., FORMERLY INSTRUCTOR AT MARE ISLAND NAVY YARD AND W. A. VETTER, FORMERLY CONSTRUCTION FOREMAN FOR THE MARCONI WIRELESS TEL. CO. INSPECTION INVITED. SEND FOR DESCRIPTIVE CIRCULAR.

433 NEW CALL BUILDING

SAN FRANCISCO

FOR PERFECT SIGNALS AND SOLID COMFORT, WEAR Brandes Matched Tone Receivers



"Superior" 2,000 ohms weight 14 oz., complete with head band and polarity indicating cord. Price \$8.00.

Send 5c for catalogue "C"

We were not satisfied when we accomplished mechanical perfection of our receivers to such a high degree. Lightness and comfort are almost as necessary as the perfectly matched tone for which Brandes Receivers are famous.

We, therefore, equipped our receivers with an improved head band instantly adjustable to any size head. Check nuts hold the adjustment. Made of Galvanized Piano Wire, covered with strongly woven Khaki. NO metal parts come in contact with the wearer's head, and the head band cannot catch the hair even when adjustments are made on the head. Other metal parts are nickel plated brass, making the head band absolutely rust proof. Our new head band is the strongest, most durable and lightest of its kind on the market.

Our receivers are now equipped with polarity indicating cords. This eliminates any danger of demagnetizing the receivers when Vacuum Valve Detectors are used.

Give yourself a Christmas present. Order any pair of our receivers, try them for 10 days in comparison with the phones you have now. If they aren't better receivers for clearness, sensitiveness, distance and comfort than what you are using, return them to us, and back comes your money immediately and without question.

C. BRANDES, Inc. Wireless Receiver Specialists
Room 819, 32 Union Square, New York City

NOSTAT "Conqueror of Static" Cutting The Cost of Radio

NOSTAT ACOUSTIC TUNING CHAMBERS
IDENTICAL IN MATERIAL, WORKMANSHIP AND DESIGN
TO OUR FAMOUS MODEL 4, BUT WITHOUT TELEPHONE, BINAURALS OR BASE.

Ready for use with your own receivers, and the price—lower than
that for which you could make them—**\$10.95**

For working through
(QRN) or (QRM)



The one piece of Radio
equipment you can not
afford to be without

For Sale by
NOSTAT COMPANY 118 St. James Pl., Brooklyn, N. Y.

A CHRISTMAS COMBINATION

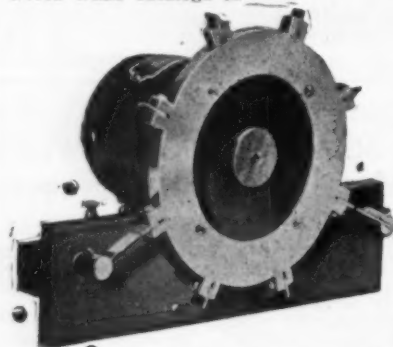
Pacific Radio News and Q. S. T. for one year, \$3.25. Regular Price, \$4.00. An appropriate
gift for your radio friends.

PACIFIC RADIO NEWS, 50 MAIN ST., SAN FRANCISCO



DUCK'S New Big-200 Page No. 14 Wireless Catalog 21 and 27

Mailed for 12c, either in stamps or coin, which amount you are
privileged to deduct on your first order of \$1.00. Catalog post-
ively not sent otherwise. This edition of our wireless catalog
is the most complete and elaborate we have ever put out. It em-
braces everything in wireless worth while. As an encyclopedia of
information it is invaluable. It is printed on excellent paper with
a beautiful cover. Your amateur friend will tell you that there never has been any
wireless catalog to take the place of Duck's, and above all, that you can absolutely
rely on the quality of every instrument listed in this catalog. In a word it is all
worth while catalogs in one.



Improved Type Sayville Rotary Gap

Embodies the latest and best features in
Spark Gap Construction.

Our New Type Sayville Rotary Gap is, we
believe, far in advance of any rotary gap on
the market within a range even of twice
the price. It is the final development of many
different types made in our experimental
Radio laboratory. It fulfills every require-
ment of the ideal rotary gap. It is neat and
attractive in appearance; simple and durable
in construction; possesses a wonderful mo-
tor; has a cast aluminum rotary wheel,
beautifully polished; every part is in perfect
alignment; there is no wobbling of the
motor; produces and maintains a clear and
pure 500-cycle note; is instantaneous in ac-
tion; permits of no dragging of the spark;
has contacts of tempered flat copper of
proper length and width, easily and quickly
removable, and inexpensively renewable; the stationary contacts are adjustable to
any length.

The picture above really does not do it justice. There is no rotary gap we have
ever sold that we consider in the same class with this gap, and we have therefore,
discontinued the sale of all other types listed in our catalog.

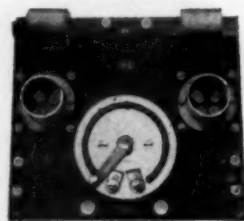
Any purchaser is privileged to return it within three days if it does not come
up to all the high claims we make for it. A first-class Rotary Gap is the very
heart of an efficient transmitting set, and we cannot too strongly emphasize care
in the selection of this instrument if effective and dependable results are desired.

No. A1798—Improved Type Sayville Rotary Gap (shipping weight 9 lbs.).....\$27.50
Renewable Rotary Electrodes (not less than five sold), each......05
Renewable Stationary Electrodes, each......10
Type A Motor as supplied with above gap (shipping weight 6 lbs.)..... 15.00

THE WILLIAM B. DUCK CO., 210-212 Superior St., Toledo, Ohio

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Do
You
Know



that the ACE Type B 2-step Am-
plifier will give you 450 times am-
plification of signal? Price \$20.00,
ready to wire. Diagram furnished.

We manufacture and handle com-
plete lines of Radio instruments
and accessories.

Write for catalog.

"You may pay more—but you can't
buy better."

THE PRECISION EQUIPMENT CO.
2437 GILBERT AVE., Dept. F
CINCINNATI, OHIO



Our Paragon Rheostat

has become the
standard filament re-
sistance. For back
of panel or table
mounting. 2 1/2-in di-
ameter. 6 ohms.,
1 1/2 amps.

\$1.75 Postpaid

Immediate shipment.

Standard VT Socket \$1.00. Why pay More?

4 Volt Variable "B" Battery, \$3.60

Include Postage on 4 Lbs.

Complete in handy wooden case and ad-
justable phosphor-bronze "Jiffy" con-
nectors. Better than block batteries! If
one 4.4 V. unit weakens prematurely, it
can be removed and replaced, thereby
not impairing the total voltage—making
this the best battery value on the market.

Audiotron Adaptor

Consists of standard 4-prong
base with brass supporting
connectors. Permits mount-
ing tube in vertical position,
so filament will not sag and
touch grid.

\$1.75 Postpaid

Aerial Wire 1c Per Foot
7 strands No. 22 solid cop-
per—tin plated to prevent
oxidation. Include postage on
15 lbs. per 100 feet.

Ground Wire 8c Per Foot

\$7.00 Per 100 Feet
No. 4 solid copper—triple
braid—rubber covered. In-
clude postage on 20 lbs. per
100 feet.

Lightning Switch \$4.00
600 volts, 100 amps., S.P.D.T.

Radio Equipment Co.

630 Washington St.
Boston-11, Mass.

METEOR ELECTRIC CO.

309 So. Flower St.,
Los Angeles, Calif.

MANUFACTURERS AND
RETAILERS OF

RADIO APPARATUS

Also Parts and Supplies

We Have An Exchange Dept.

Used Apparatus Bought, Sold and
Exchanged

CONDENSER OIL

THE EDITOR'S MAIL BAG

(Continued from page 133)

Oakland, Calif.,
October 13, 1920.

"Pacific Radio News",

San Francisco, Calif.

Dear Editor:

I, as most other amateurs, are behind you in your crusade to stop the unnecessary QRM that many amateur stations are causing in the immediate vicinity of the Bay Districts.

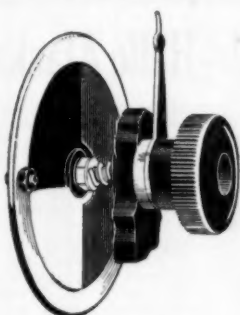
When I read of the several letters written by "Kicker" and Mr. Newall in your last issue, it makes me think that the air hogs should "get next to themselves" and stop this QRM and QSA business. Things are no better than before—in fact, they are getting worse. The fellow making the most noise is not the one who is doing the long distance work. I have taken the stand that I will not answer the question QSA and QSK, unless I know that the fellow has just tuned his set or something of the sort. I am asking every reader of "PNR" to take the same stand and if you see fit to publish this letter in your columns I feel that it will help the campaign. I ask all radio men to join me in this absolutely necessary stand against selfish children. An Old Timer.

THE TELEPHONE BUG

Good Lord—where are all those radio telephones coming from? Every night I hear another one busting in on us. We fellows with spark coils and transformers had better start a league to eradicate those music-sending animals. DeForest is making the California Theatre work overtime for his phone set. Poor old DeSousa is hitting the ball via 6BN. Art Hickman's records are being worn flat by 6UV and several fellows in Oakland are stepping lively between the phonograph store and their radio station with reinforcements in the line of needles and phonograph springs. The "dearie" stuff is still hopping over the Catalina circuit and Mr. Petersen is giving his one-lunger the "high" out on Grove street. Aeroplanes with phones are flying over our heads; underground phone systems are springing up and a city phone is on my desk. Well, I'm drunk with the fever. Does anybody around here want to buy a perfectly good ½ K. W. transformer with accessories?

You can buy that new apparatus with the commission money that you realize on subscriptions secured for "Pacific Radio News." We have a good proposition for you. Write for full details.

Turn your spare time into dollars by securing subscriptions to "Pacific Radio News." Any ambitious amateur can handle our new proposition. It will interest you. Write for details.



A New Invention

The Parkin .001 mf Variable Condenser (pat. applied for) fills the long felt want for a rugged, low priced, balanced variable condenser for panel mounting. No plates to bend and short circuit. Cannot get out of order. Has very low minimum capacity. Easily mounted, only one small hole being necessary in the panel.

Guarantee: All Parkin Condensers are sold subject to return within five days if not fully satisfactory.

No. 50 .001 mf Unit alone, may be mounted on any shaft....\$1.50 postpaid
No. 51 .001 mf Unit with knob, pointer, etc., as shown.....\$2.00 postpaid
No. 52 .001 mf Unit with knob, etc., and 3-inch black dial\$2.50 postpaid

Write for full description of this new invention

Ask for Circular No. 16

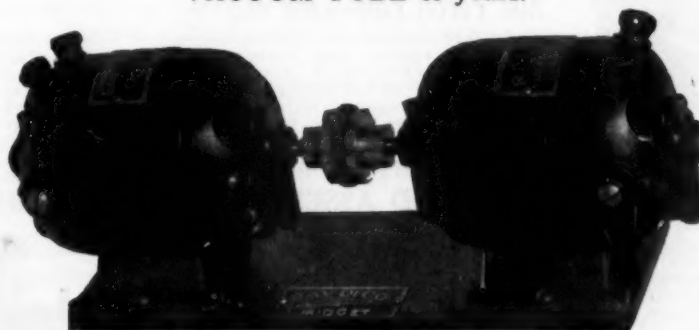
Dealers: Write for discounts

PARKIN MFG. CO.,

San Rafael, Calif.

WHY THE Q. R. M.?

Use UNDAMPED WAVE transmission. Now made possible by the "MIDGET" Motor Generator Unit, designed for that VACUUM TUBE of yours.



A "MIDGET" Motor Generator unit

installed on your radiophone ELIMINATES cumbersome transformers and rectifiers. No induction hum. CONSTANT VOLTAGE. Efficient operation. Self regulating. No starting device or field rheostat necessary. MOUNTED ANY PLACE, back of panel, in cabinet, under table. AMPLY SUPPLIES THREE VACUUM TUBES.

MOTOR—Universal wound. Operates satisfactorily on A. C. or D. C. 110 or 220 volts.

GENERATOR—Shunt wound. 15 watts capacity at 275 volts D. C. DIMENSIONS—5½ in. x 4 in. x 11½ in. Net weight 9½ lbs.

Both machines mounted on common cast iron base, coupled together by means of flexible insulating coupling, allowing quiet operation and perfect alignment.

F. O. B. Chicago, Ill., \$42.35

Can be shipped via Parcel Post

Our "HYLO" motor generator unit, supplying both FILAMENT CURRENT and PLATE CURRENT, thus eliminating the possibility of DEAD STORAGE BATTERY at a critical moment. Made in capacities up to 100 watts, at 500 volts.

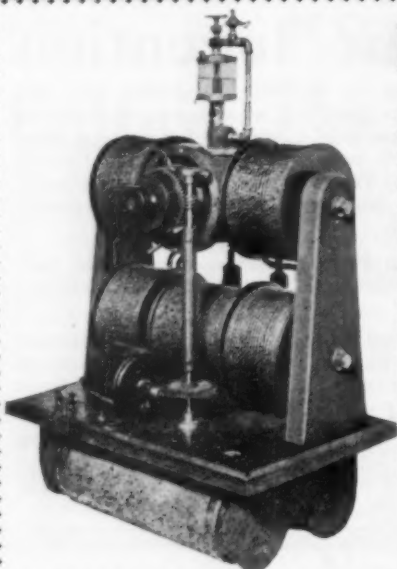
The "STANDARD" Motor Generator unit made in capacities of 50, 100 and 175 watts, at 500 volts.

RAY-DI-CO.

(Not Inc.)

2653C N. Clark St.

Chicago, Ill.



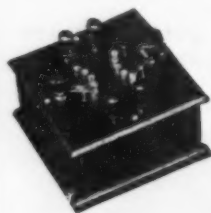
Hello Honolulu-Hello Alaska

Everybody will hear you if you open up with twelve amperes in your antenna on 4000 meters using continuous waves from this 5 K.W. Arc Converter. Designed and constructed by the author of "The Design and Construction of a One Kilowatt Arc Converter," "Arc Radio Apparatus," etc. Signals from this converter have been reported loud at 1500 miles during daylight. Operated by 500 volts D.C. (street railway voltage). Chamber and electrodes water cooled—just connect to fresh water service. All castings are made of bronze and carefully machined. Solenoids alone contain over one hundred pounds of copper wire. Operates best on wave lengths in excess of 3000 meters, although with a chopper much lower wave lengths may be used. This piece of apparatus is mechanically and electrically perfect. Its service has been confined almost to research work by experienced and careful operators. Cost \$400.00 to build. Weight 300 pounds. Complete with carbon rotating motor and choke coils under base.

Price \$200.00, F. O. B. San Francisco

Jennings B. Dow

U. S. S. TEXAS, SAN FRANCISCO, CAL.



HOOK 'ER TO YER BULB

The Most Wonderful Tuner in the World for \$10.00
Add Parcel Post—Coils only - - - - - 6.00

About four months ago I purchased one of your mysterious 20,000 meter tuners. And today am copying POZ—YN—NPM—MUU—LCM—IDO—OUI. Haven't had much time to sit in but the best part to tell you about this black box is that all this foreign stuff comes in on a 35 foot aerial 35 feet high on one end and 20 feet on the other end. I'm always ready to recommend the black box instead of any other inductance made.

(Signed) ERNEST F. SCHWACH,
1637 Parkside Ave., Chicago, Ill

KNOCKED DOWN AND ASSEMBLED CONDENSERS

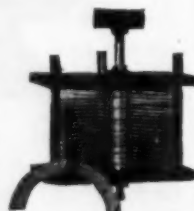
Which kind do you want? Made for panel mounting and are complete with scale pointer and knob. Used all over the world now and still going strong. No C.O.D. orders. Add parcel post. Buy from your dealer and send us his name if he cannot supply you. Canadian amateurs buy from local dealers or write us for nearest dealer. Formica tops and bases. Movable plates are screwed on and not clamped.

11 Plate K.D.	.....\$1.80
21 Plate K.D.	.....2.25
41 Plate K.D.	.....3.20
11 Plate assembled	.....2.75
21 Plate assembled	.....3.25
41 Plate assembled	.....4.25

SOLD BY YOUR DEALER OR

TRESCO, Davenport, Ia.

Be a sport and send 5c for our Catalog. Foreign orders solicited. Canadian Amateurs buy from Canadian dealers. All products licensed under Marconi and Armstrong Patents.



BURGESS "B" BATTERIES

SEVERAL
SIZES
FOR
SPECIAL
WORK



SEND FOR CATALOGUE
**BURGESS BATTERY
COMPANY**

HARRIS TRUST BLDG. - CHICAGO, ILL.

"B" Batteries

AN
**EVEREADY
PRODUCT**

Guaranteed 45 volts
Six Taps

**\$5.00 prepaid anywhere in
the United States**

We also build any type of set to
order. Send us your specifications.

Ets-Hokin & Galvan

Wireless Engineers

10 Mission Street San Francisco

EXPERIMENTERS

who send orders to the G. A. never experience endless delays and needless letter writing.

Grid
Condenser ...35c
Phone
Condenser ...35c
Gridleak
Condenser ...50c
Add 5c for mailing

All Over the World

In nearly every country of every continent, from Bombay to Cape Town, from Madrid to Rio, from Sidney to Hawaii, G. A. Condensers are in service, replacing expensive fixed condensers or grid leaks and grid condensers. Many manufacturers use them as standard equipment on their apparatus. You To . . . —



THE GENERAL APPARATUS COMPANY, Inc., 570-P West 184 St.
NEW YORK CITY

When writing to Advertisers please mention this Magazine

Storage Batteries

are but one of several hundred radio accessories supplied by us. Order anything of standard make advertised elsewhere and get immediate delivery in a single package, that's SERVICE. Send stamp for details of SAVING you can make.



C-1 4 volt 20-40 amp hour.....\$ 7.25
C-2 4 volt 40-60 amp hour..... 10.75
C-3 6 volt 20-40 amp hour..... 10.75
Type "C" designed especially for lighting vacuum tube filaments. Supply limited.
T-1 4 volt 20-40 amp hour.....\$10.75
T-2 4 volt 40-60 amp hour..... 14.50
T-3 6 volt 20-40 amp hour..... 16.25
T-4 6 volt 40-60 amp hour..... 20.00

Type "T" designed for automobile trade are excellent for tube lighting.
F-1 6 volt 60 ampere hour.....\$19.00
F-2 6 volt 80 ampere hour..... 24.00
Type "F" designed for the new Ford car are also excellent for tube lighting or spark coil work.

Add 5 per cent excise tax to these prices which are FOB Marko factory Brooklyn, N. Y.

Mutual Purchasers Association

Dept. P-1 24 Stone St., New York



DOOLITTLE DECREMETER

A superior Wavemeter and a Decremeter in one instrument. Will enable you to adjust your station to the legal requirements and at same time improve the efficiency of your transmitter. PRICE \$25.00

Shipping weight 4 lbs.

F. M. DOOLITTLE CO.
157 Valley St. New Haven, Conn.

WANTED

Amateurs to Secure Subscriptions

PACIFIC RADIO NEWS

Pacific Radio Pub. Co.
50 MAIN ST. SAN FRANCISCO

Here is an Unexcelled Value in a Variometer for Regenerative Work on Short Wavelengths



It is designed for use in plate and grid circuits and may be used either for cabinet mounting or otherwise. It is provided with a non-capacity aluminum dial and scale 5 inches in diameter, with a bakelite knob. Guaranteed to be the equal in working quality of any variometer on the market, or your money cheerfully refunded.

Send 15 cents in stamps for our catalogue, illustrating many other values equal to the above. All apparatus either in knock-down or finished form. Dealers write for trade discounts.

OARD RADIO LABORATORIES
"Your Ears Tell"
STOCKTON CALIFORNIA

--MARCONI INSTITUTE--

Conducted by the greatest and most experienced radio telegraph organization in the world.

Thorough training given in radio operating, traffic, and in damped and undamped systems.

Tuition ten dollars a month for either the day or evening sessions or both combined.

RADIO CORPORATION OF AMERICA

Phone Douglas 3030

335 New Call Bld., San Francisco

Our Specialty

Just the instrument you want at the right time. When no other dealer can supply you—we can. Our most complete stock and large buying power, coupled with economical methods, enables us to offer you everything in Radio at the time you want it and at very favorable prices.

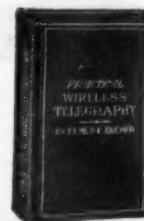


BRANDES TELEPHONE RECEIVERS

2,000 ohm	\$ 7.00
3,200 ohm	14.00
2,800 ohm	10.00
1,000 ohm (one phone only).....	2.75

WIRELESS BOOKS

We can supply you with any wireless book published. Wireless Press Books, Cole & Morgan Books, Consolidated Radio Call Book. All other radio books of value to the amateur.



Mail orders promptly filled. Send five cents for our new complete price list of all radio apparatus and parts today.

AMERICAN ELECTRO TECHNICAL APPLIANCE CO.

Dept. P. R.

235 Fulton Street

New York

GALENA TESTED CRYSTALS—Large Piece 25c
Radio Sales Co., 251 Duboce Ave., S. F.

When writing to Advertisers please mention this Magazine

Audion Control Panel



With this panel the regular Marconi 4-prong bulb, an Audion-tron can be used. Same shipped to any part of the U. S. for \$6.50.

Grid Condensers, each	.....\$ .35
Stopping Condensers, each	.....\$ .35
De Forest Coils, Form Wound (DL):	
No. 25 to 1500, inc.	.....\$1.65 to \$4.10
Radisco Coils:	
No. 40	.....\$ .70
No. 100	.....\$ .95
No. 175	.....\$ 1.15
No. 325	.....\$ 1.40
No. 550	.....\$ 1.65
No. 750	.....\$ 2.00
No. 1200	.....\$ 2.65
Radisco Coils with Taps:	
No. 325-3	.....\$ 1.70
No. 750-3	.....\$ 2.30
No. 1200-3	.....\$ 2.90

Agents for RADISCO Apparatus
KELLY & PHILLIPS
 Brooklyn's Wireless Store
 312 Flatbush Ave. Brooklyn, N. Y.

Radio Engineering Principles

By Henri Lauer and H. L. Brown

This is one of the first books to cover progress in radio engineering during and since the war. It contains much valuable information on vacuum tube theory and practice. A worthy addition to any wireless man's library. A postcard puts you on our mailing list. 290 pages, cloth. Price \$3.50 postpaid.

SWANSON BROS.
 TECHNICAL BOOK SERVICE
 Dept. A. 186 No. La Salle St., Chicago

Classified Advertisements

ADVERTISEMENTS IN THIS SECTION ARE THREE CENTS PER WORD NET. REMITTANCE, IN FORM OF CURRENCY, MONEY ORDER OR STAMPS, MUST ACCOMPANY ORDER.

FOR SALE: Tuning cabinet with set of 12 honeycombs, \$65. If interested write for description and photo. E. BANCROFT, Sonoma, Calif.

FOR SALE: WIRELESS TRANSMITTING AND RECEIVING SET. $\frac{1}{2}$ K. W. Transformer, Murdock Rotary Gap, 6 Section Murdock Condenser, mounted on asbestos frame. Holtzer Cabbott phones, Remler audion panel and Bulb, storage battery, \$75.00. A. H. Schulz, 1445 Cole St., San Francisco.

FOR SALE OR TRADE: 1 KW Type R Thordarson Transformer. Want wireless instruments, also power tubes. Highest offer takes. No Junk. RUSSELL HUCKSTER, Sebanon, Indiana.

EXPERIMENTERS—Chemicals, chemical apparatus, books, sets, everything for the laboratory. Price list 5 cents. NATIONAL SCIENTIFIC SUPPLY CO., 241 Pa. Ave., Washington, D. C.

RADIO PHONISTS ATTENTION. HIGH VOLTAGE GENERATORS. We supply these motor generator sets in various capacities, especially designed for radio phone work, also low powered rotary converters, dynamotors, fractional H. P. motors and storage batteries. We are in a position to solve your generator problems and supply machines to fill your requirements. We also have the standard RAY-DI-CO phone sets complete, or furnish any part thereof. In fact, if it is radio equipment of any kind, or a set of your own design, write us stating your requirements and become acquainted with our SERVICE. RAY-DI-CO (Not Inc.) 2653 C. N. Clark St., Chicago, Ill.

MANUFACTURERS AND DEALERS IN RADIO APPARATUS: The Dayton Y. M. C. A. is opening a school in Radio Telegraphy and Telephony. They wish to purchase all makes of radio apparatus at dealers' prices and resell to students only at a nominal discount, just enough to pay the overhead. Manufacturers interested please send catalogs, literature and discounts to Radio School, Y. M. C. A., Dayton, Ohio.

NEW SINGLE DIAL OMNIGRAPH with 13 extra dials, \$10. Three Western Radio Unit Loads, brand new quartered oak case, bakelite switch front, seven taps, pancake coils, 1-15,000, \$6.00. 2-10,000, \$5.00 each, postpaid. Want amplifying transformer, phones. Martyn Coony, 475 30th St., San Francisco.



"Insulate" Handles, Knobs

and
 OTHER INSULATION ACCESSORIES
 for WIRELESS, etc.

Made either of the Best Substitute for Hard Rubber or "HI-HEAT" resisting synthetic materials
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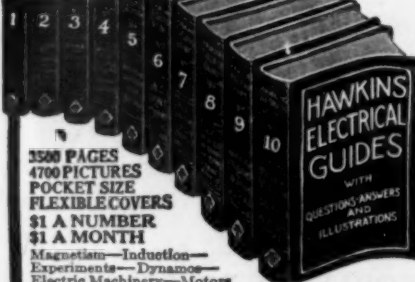
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Include postage on 1 lb.

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Hard detector and amplifier, normal plate voltage—40, but E. M. F.'s up to 100 volts may be used with increasing amplification. Use this tube in connection with UV-200 for best results.

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Tubes 175-600 meters. This set consists of a vario-coupler, a variometer connected in the grid circuit and a variometer connected in the plate circuit together with a grid condenser and a grid leak. B. D. panel engraved and fitted with three 3 inch dials. The best value on the market.

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Complete with switch, switch points and knob to match knob on dial,

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Same, but wound with No. 14
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The Radio Telephone Shop will not be responsible for goods damaged while in our shop, nor for goods damaged in transit. The Radio Telephone Shop will do its best to take good care of instruments and when shipping will wrap properly.

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**Give us a trial. YOU WILL APPRECIATE OUR SERVICE AND
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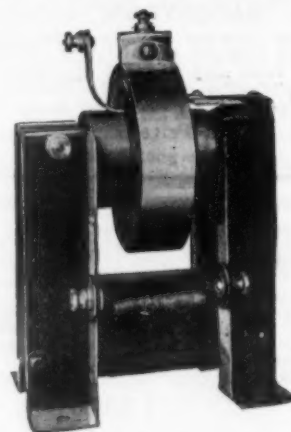
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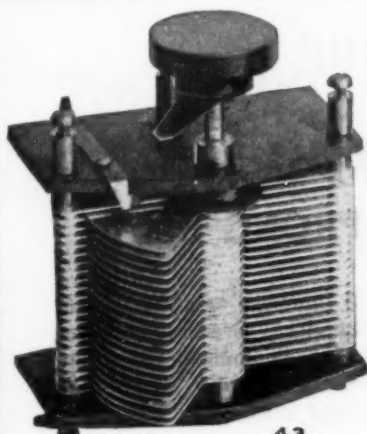
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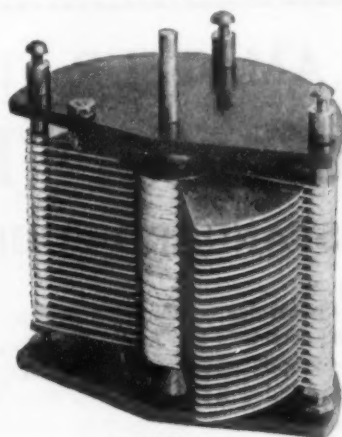
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43



4300

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Built along the same general lines as our SERIES "S" condenser, but heavier construction throughout. The plates are die-stamped from 1/32" hard rolled aluminum, and are separated by heavier spacers. Extreme rigidity, best of materials, accurate machine work and careful assembly are the outstanding features of construction. At the present time we are unable to fill orders for the SERIES "S" condenser, as we are unable to obtain materials for its construction, but we can ship the NEW SERIES "T" and the SERIES "L" VARIABLE CONDENSER from stock.

REMEMBER—WE ABSOLUTELY GUARANTEE SATISFACTION OR YOUR MONEY BACK.

SERIES "T"			—PRICES—	SERIES "L"		
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No. 130	13 "	.0002 m.f.	2.75	No. 6300	63 plate, .002	10.00
No. 170	17 "	.0003 m.f.	3.15			
No. 230	23 "	.0005 m.f.	3.60			
No. 310	31 "	.0007 m.f.	4.30			
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No. 630	63 "	.0015 m.f.	7.50			

Either style of condenser fitted with indicating dial
at additional cost of 75c.

Includes postage for two pounds

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Either style of condenser fitted with indicating dial
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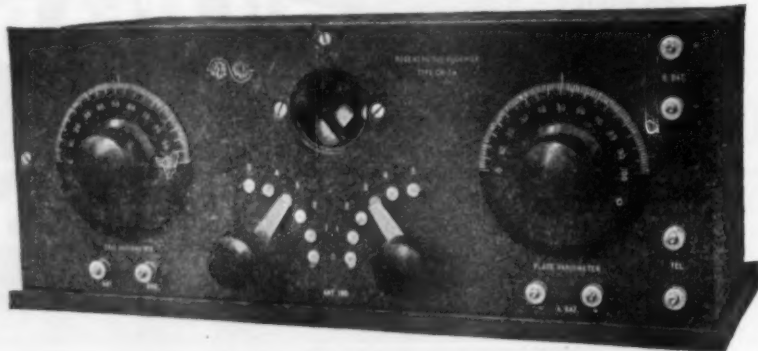
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You can knock home runs into the long distance field every night in the year with the dependable



Type CR-3A
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The CR-3A includes a variable antenna circuit, continuously variable grid and plate circuits, a specially designed coupling circuit and a standard vacuum-tube mounting with a grid condenser and leakage element. All binding posts are conveniently located on the front of the panel. The price, \$45.50, is within the reach of all.

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TYPE C 300 possesses combination properties—it functions as a highly sensitive spark detector, an Audio-Frequency Amplifier, an Oscillator for regenerative amplification and C. W. reception, a radiophone detector and amplifier—with the added advantages of low B Battery (18-22½ volts) ease and permanency of adjustment, uniformity and quietness. **\$5.00**

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Your radio station is not operating at top-notch efficiency unless a **genuine Dubilier Mica Condenser** is used in your transmitter.

Dubilier Mica Condensers are unquestionably the most efficient condensers on the market; they are used by all the Radio Departments of the United States government, and other countries, and they will be found in the stations of all amateurs who are breaking records.

THERE IS A SIZE FOR EVERY STATION

Type	Watts	Max Tstd Voltage	mfd.	Price	Type	Watts	Max Tstd Voltage	mfd.	Price
D100	250	10,000	0.007	\$19.00	D110	250	10,000	.01	\$21.00
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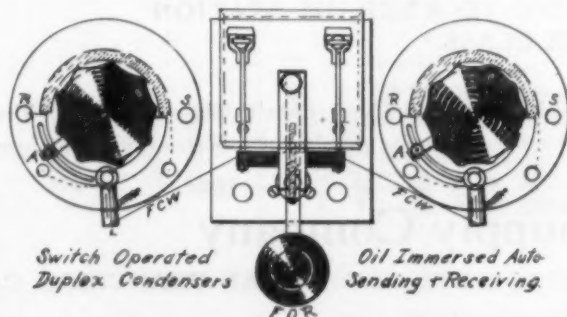
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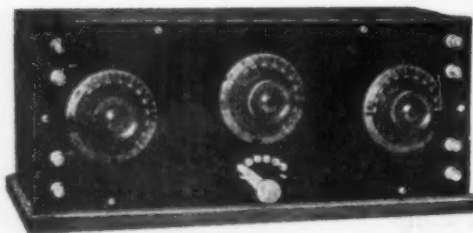
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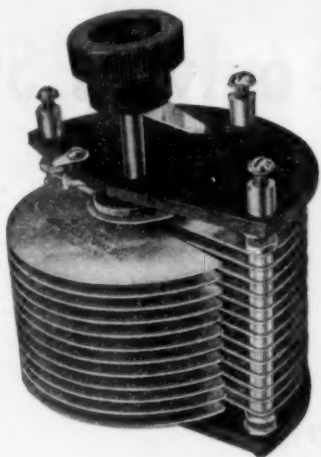
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643 MISSION STREET

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The new “Wireless Shop CW” Variable Condenser was developed to meet the demand for a condenser which would not break down when used with high plate voltages. You don't have to take your receiving condensers to pieces and add spacers any longer. The NEW WIRELESS SHOP CW VARIABLE CONDENSER does the trick.

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—PRICES—

No. 1500—15 plate, approximately .0004 m. f. max. capacity.....	\$6.00
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Regularly fitted with mounting screws and knob and pointer. Will be supplied with a metal dial instead of pointer at 75c additional, or with a moulded Bakelite knob and dial, finely engraved with graduations and numbers filled in white at \$1.00 extra.

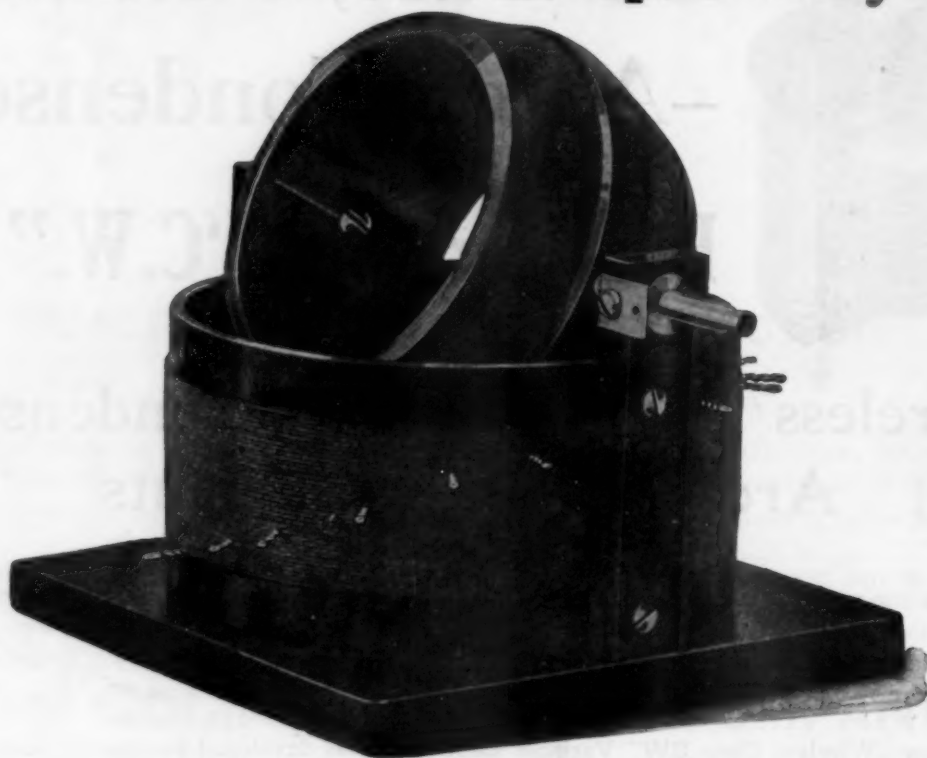
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First, in design and construction, it sets new standards of mechanical and electrical efficiency.

Second, the materials,—special moulded composition, Formica, and brass,—will deliver years of uninterrupted service.

Third, it's entirely standardized and machine made. If, after long service, some parts need replacing, you will find that the new parts will vary less than .002 of an inch,—a fraction of a hair's breadth.

Finally the price, only \$6.50. It's hard to compare prices, because there never was a coupler so well-made, so accurate, so good through and through! But, at least, you have the satisfaction of knowing that the standardized, machine, quantity production, not only insures a vastly improved instrument, but also gives you unequalled value per dollar.

No printed words can possibly give you the evidence of quality, equal to an examination of this coupler at your Radisco dealer's. But in the meantime, these specifications will indicate the care and value that is put into every detail of the construction:

The ball and base are special moulded composition, high polished, which cannot warp. The tube is black Formica that will not shrink or absorb moisture under any condition. A treatment of special insulating compound and best grade insulating varnish insures perfect insulation throughout.

The hard brass bearings, with phosphor bronze contact springs, are supported by moulded "U-Beam" strips of Bakelite. The shaft projects far enough for panel mounting, and is 3/16" in diameter, to fit the standard Corwin Dials.

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15 Temple St.

SEATTLE, WASH.
Northwest Radio Service Co.
609 Fourth Ave.

SCRANTON, PENN.
Shotton Radio Mfg. Co.
P. O. Box 3
Branch, 8 Kingsbury St.
Jamestown, N. Y.

TORONTO, ONT., CAN.
The Vimy Supply Co.,
567 College St.

WICHITA, KAN.
The Cosradio Co.
1725 Fairmount Ave.